BASUTOLAND

DEPARTMENT OF AGRICULTURE

ANNUAL REPORT 1960

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DEPARTMENT OF AGRICULTURE - ANNUAL REPORT, 1960.

Contents - Section II - 'Page 8' Not 'Page 11'.

Page 15 - - Title - 'Progressive Farming and other Activities.'

Page 19 - Credit Societies. 'Total number of Societies 1960/61 - 93.'

Page 39- Second paragraph. '...Stallions have been sold at prices ranging from £40 to £50.'

Page 39 - '8, Cattle Improvement ' - 'To date 60 bulls have been imported.

Page 33 - Grand Total - 6,786,296.

Page 50 - Totals - Coniferous 1959 - 30,907.
Poplars 1959 - 850,646.
Willows 1960 - 12,808.
Total 1959 - 908,040.
Butha Buthe 1960 - 122,801.
Total 1960 -1,249228.
Grand Total 1959 - 907,194.
Grand Total 1960.12,449,228.

BASUTOLAND

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DEPARTMENT OF AGRICULTURE

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ANNUAL REPORT 1960

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Basutoland

CONTENTS

THE AGRICULTURAL INDUSTRY OF BASUTOLAND AND ACTIVITIES OF THE DEPARTMENT OF AGRICULTURE

PART I

Section I	Review	1
Section II	Agricultural Education and Public Relations	11
Section III	Progressive Farming and Other Activities	14

PART II

Section I	Crop Production and Food Supplies	28
Section II	Livestock Industry	31
Section III	Veterinary	40
Section IV	Soil Conservation	44
Section V	Forestry	49
Section VI	Statistics	52

PART III

RESEARCH AND INVESTIGATION

Soil and Crop Research 55

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THE AGRICULTURAL INDUSTRY OF BASUTOLAND AND ACTIVITIES OF THE DEPARTMENT OF AGRICULTURE

PART 1

SECTION I

REVIEW

1. THE TERRITORY

Basutoland is an enclave within the Union of South Africa some 11,700 square miles in extent. Recorded temperatures in any one place can vary from plus/minus 90 degrees F. in summer to plus/minus zero in winter. The usual daily variation in temperature is in the region of 40—50 degrees F., that is day time maximum to early morning minimum; this range, of course, varying to some extent with the seasons. Rainfall is variable, but averages 29 inches yearly in the lowland and foothill areas mostly occurring during the summer months, October to March. The growing season for the main crops is comparatively short, commencing with the arrival of spring rains during September to October and terminating with the advent of the first frosts, which usually occur towards the end of April.

Agricultural pursuits occupy the greater part of the time of the country's inhabitants. Maize, forming the basic diet of the Basuto people, is grown widely throughout the country with particularly heavy concentrations in the lowland belt and the fertile foothill valleys. Despite the unsuitability of the climate in the mountain areas for the production of maize the inhabitants of these parts still continue attempting the production of a crop which four years out of five will succumb to frost at a critical period in its growth. Money earning products are wool, mohair, wheat, sorghums and peas, given in descending order of cash value to the producer.

Four-fifths of the Territory are steeply mountainous and almost without roads, although bridle paths and tracks, negotiable only by mules and pack-horses, abound. The 250,000 inhabitants of these parts rely almost entirely upon these small, sure-footed animals for the transportation of themselves, their produce and their requirements.

The remaining one-fifth of the Territory consists of a lowland area where soils are largely derived from sandstone, usually much less productive than the rich basalt mountain soils from which latter, rainfall and human effort are the factors largely determining the final gain.

The great proportion of the population lives, however, in the lowlands and foothills to the west of the Territory, where climatically and geographically, living conditions are not quite so difficult as in the mountain areas; but here crop yields are poor on account of soils which are fundamentally lacking in plant nutrients having been subjected to many decades of exploitation. Monoculture, lack of return of animal and crop wastes to the soil and extensive soil erosion form the background to the crop production picture in the lowlands.

The total area of land in the Territory estimated as being under cultivation is in the region of 1,000,000 acres.

This figure continues to increase each year as more and more virgin land is ploughed up, particularly in the mountain areas where temporary homes, used in the past during the summer only whilst herding stock, tend to become permanent.

At the present rate of increase it is estimated that the population will reach 1,000,000 by 1963.

2. POLICY

During the year there has been a further move away from any form of restrictive measures and a genuine attempt on the part of departmental staff to indulge in true extension and advisory work. The main avenues of approach have been through the media of the Progressive Farmer movement and the agricultural Credit Societies, details of which are recorded in para Politicians in the form of members of National and District Councils continue to criticise, often vehemently, the activities of the department and its staff. Many of the outbursts are occasioned by growing pains and merely permit the orator to gain political kudos at the expense of the department. On the other hand one cannot ignore the often useful criticisms and suggestions found hidden among these oratorical demonstrations.

It has been found advisable on the part of the Department to watch the political front as it develops and to take action wherever considered necessary but not to attempt to deal with every criticism just or unjust as it occurs nor to pander excessively to the demands of individual politicians.

Just as it has been found wise to keep a close watch on the activities of politicians and to act when necessary, so it has been found equally wise to concentrate efforts upon the improvement of agricultural practices amongst the individual farmers. The satisfied farmers, whose numbers are increasing daily, do much by practical example to the community to offset the often extravagant and sometimes untrue criticisms of their political brethren.

The statement of policy submitted by the department for consideration by Executive Council some considerable time ago has received scant attention.

Present Policy aims at

(1) Developing to its fullest the close bond which exists between the Department of Co-operatives and this department. This link ensures greater efficiency in supplying farmers with credit and marketing facilities. See

(2) Coupling the practical side of better farming with formal and informal education in farming matters. This is brought about by the recently established section for public relations and extension which operates within the department. See

(3) Providing in service training for all grades of staff in order that they in turn become capable of helping farmers to deal with their many and varied problems. See

(4) Combining much more fully the activities of the veterinary section (which will in future be known as the animal husbandry section) with the arable or crop production section and the section connected with grazing control.

(5) Assisting and advising wherever requested or wherever appears to be necessary the recently formed District Councils.

(6) Maintaining a healthy liaison with the Paramount Chief's office in order that he may remain fully acquainted with agricultural progress and problems in the Territory.

(7) Maintaining close co-operation with the department of Local Government in order to ensure both departments "speak with one voice on agricultural matters".

(8) Maintaining and improving departmental services to the farming public.

Future Policy.

Much will depend upon constitutional development within the Territory but in general the aim will be to improve upon the present policy and to keep it in step with future constitutional and administrative development.

3 STAFF.

Disposition of staff as at 31st December, 1960, is given at Appendix.

Two posts of Agricultural Officer were filled in August when Messrs C. J. Mills and J. Presswood arrived in the Territory from England.

The following officers proceeded on leave pending retirement during the year:—

Mr A. G. Brightsmore, Senior Agricultural and Livestock Officer.

Mr I. L. Chard, Senior Agricultural and Livestock Officer.

Mr J. G. S. Bennie, Wool and Mohair Officer.

Mr V. S. Gilbey, Agricultural and Livestock Officer.

Miss H. B. Corney, Senior Lady Clerk.

Mrs J. Heard was transferred to the Department from the Secretariat as Staff Clerk.

Awards: Mr A. Mathule, M.B.E., in Birthday Honours List.

4 WEATHER CONDITIONS.

Rainfall statistics are given at Appendix.

In general 1960 was a good year for crops. Many mountain areas reported a frost or fall of snow early in January and this damaged maize crops. During January-April rains were widespread and fairly regular. One or two districts suffered from hail damage and some areas reported snow in the higher parts. The winter months May-August were comparatively mild and in all parts there is a record of rainfall. In spring September-November rainfall was again widespread and ample for ploughing purposes, permitting the present crops to get away to a good start. In December, however, droughty periods became apparent and crops entered 1961 with prospects of failing partially.

5. VISITORS AND VISITS.

His Excellency Sir John Maud accompanied by Lady Maud attended the Central Agricultural Show in June.

Among the many other visitors, given in chronological order, were the following: Mr A. G. G. Hill, Director, Commonwealth Bureau of Pastures and Field Crops — advising and fact finding; Dr Cumming, Head of poultry section at Onderstepoort, to advise on poultry production; Mrs Jacot Guillarmod of Rhodes University to undertake a botanical survey in the Ox-Bow area; Mr Ryan, Assistant Editor of London Times; Dr F. S. Simmonds, Director of the Commonwealth Institute of Biological Control; Mr Gregory,

a United Kingdom Information Office photographer; Dr Hickling, Fisheries Adviser to the Secretary of State; Dr Thomas, a helminthologist from the United Kingdom; Mr Cater, of Colonial Development Corporation; Mr Sykes of the Commonwealth Relations Office Mr Davis, High Commissioner for Australia; Mr Baker, of the South African Council for Industrial Research; members of the Imperial Defence College; Mr Borthwick, of the United Kingdom Information Office, Johannesburg; Sir Gordon Hadow, in connection with the Economic Mission report; Dr Edens, Agricultural Attache at the United States Embassy, accompanied by Mrs Edens.

Several departmental officers accompanied the Paramount Chief on trek in the Semonkong area in December.

Numerous routine visits were made by members of the staff to places of interest and instruction in the Union and other High Commission Territories, including the following:

Mr D. D. Campbell, Director of Livestock and Agricultural Services, attended the SARCCUS Conference in Nyasaland accompanied by Mr S. H. Youthed, Soil Conservation Officer. The former also accompanied Chief Leshobero Majara, the Member connected with Agriculture, to the F.A.O. Regional Conference in Nigeria; Mr A. H. Gibson, Senior Agricultural and Livestock Officer, visited Pretoria to study meteorological work; Mr A. C. Macintosh, Agricultural Officer (Research) paid visits to various research stations in the Union; Mr S. H. Youthed, Soil Conservation Officer, attended several demonstrations of earth-moving techniques in the Union.

6. DISTRICT NOTES.

These notes are extracted from the annual reports of district Agricultural and Livestock Officers. They indicate some of their problems, failures and successes.

Maseru.

Rainfall 20.54in. No serious drought, frost or hail, though there was some damage to maize in the mountains. Crop harvests were all good, but not outstanding.

There are now 132 progressive farmers in the district — an increase of 24 during the year. These farm 882 acres, on which the principal crops are maize (270 acres) and wheat (276 acres). Other crops, such as sorghum, peas and beans, are of great importance to progressive farmers (113 acres, 167 acres, 14 acres respectively), who are beginning to realise the value of manuring, good seeds and sound rotation.

There are 17 agricultural credit societies with 244 members but 5 of these societies are inactive.

Fifteen new communal gardens were formed and the number of private vegetable gardens has risen to 7,398.

Briefly, the district now has a small but very active group of improved farmers and over the next few years we hope to see the number increase, becoming an example to their less progressive neighbours.

Berea.

Rainfall 36.31in. The weather was good during the year and crop yields fairly high except for the small area of mountain maize, which was destroyed by summer frost. There has been a six fold increase in the use of kraal manure and ash — up to approximately 3,500 tons in 1960. The

steady increase in use of superphosphate continues and more interest is now being shown in nitromoncal, sales of which rose from 20 pockets to 51.

There are now 82 progressive farmers (1959/60:47) farming 1,040 acres. Over half this area is still put under maize but the proportion of other crops has increased. Since the progressive farmers' scheme started a great improvement in the standard of their farming has been observed in the district. It is reported that the mountain districts need fear no famine as Berea is capable of supplying their needs!

Leribe.

Rainfall 33.37in. Frost and snow occurred in the first week of January, causing some damage to crops. Several hail storms destroyed crops at Qogolosing, Livis Nek, Motlokeng, Mohobong and Khanyane.

There are now 79 progressive farmers on 562 acres of land. Of this, 310 acres was put to maize, a lower proportion than in previous years. 23 New agricultural credit societies were formed, making a total of 24. Almost without exception the crops of these farmers are a great improvement over those of their unimproved neighbours. In future it is hoped to see the members adopt sound rotation of crops and be enrolled as progressive farmers.

The training farm is almost fully developed for training of staff and students: farmers have also shown great interest in the farm.

Co-operation with the District Council and Acting District Chief is good.

Butha Buthe.

Rainfall 33.85in. Heavy hailstorms caused considerable losses during November, December and February in some areas.

There are 60 progressive farmers, whose main crops are still maize and sorghum. Maize is often very poor because of drought. Wheat, peas and beans are of increasing importance. The use of kraal manure and ash is widespread, but results are only fair, as many farmers do not apply heavy enough dressings. Agricultural associations (51) are very active in Butha Buthe and form useful groups for lectures and practical demonstrations. In addition there are 16 agricultural credit societies with a total membership of 294.

The district Agricultural Show was most successful and well supported. That Butha Buthe is becoming show-conscious is shown by its achievement of the highest aggregate of points at the Maseru Central Show.

Co-operation with the chiefs and District Council has been good, except where grazing control and maintenance of soil conservation works were concerned. In some areas many contour banks and buffer strips have disappeared and veld burning has been widespread.

The Machobane system of intercropping seems to have fallen into disfavour with many farmers.

Mokhotlong.

Rainfall 28.1in. Crop yields were quite good, though maize was poor. Farmers still persist in growing maize even though the climate is not suitable, because of hail and frost hazards. No fertiliser was sold in the district as none was delivered. Lack of transport facilities makes the use of kraal manure and ash difficult, but there has been an increase of about 50 per cent. during the year.

There are 27 progressive farmers in the district, many of whom are keen, but it is difficult to keep their interest unless supplies of seeds,

fertilisers and implements can be improved in this mountainous area. Greater attention must be paid to livestock improvement, which is the main industry of Mokhotlong. The co-operative marketing society is very active, with a membership of about 700. This offers keen prices for all livestock products and the main crop export — peas. There is only one co-operative agricultural credit society and even though its members are very keen it has not yet brought about a great improvement in crop production as deliveries of fertiliser were not possible.

Qacha's Nek.

Rainfall 37.78in. Heavy frost in early January damaged vegetables and young crops and a hail storm in September ruined the fruit harvest.

The number of progressive farmers remained at 21, farming 157 acres. Of this area 117 acres were planted to maize and 32 acres to sorghum, crops which are not suited to the climate of Qacha's Nek. No wheat and few legumes were grown by progressive farmers, and due to the poor maize crop there has been an acute shortage of food. The number of communal gardens has increased from 61 to 85, and all the members are keen, realising that vegetables can go a long way towards improving nutrition. Cabbage, carrots, swedes and swiss chard are still the most popular garden crops.

There are no agricultural credit societies.

It has been a disappointing year. There is still a great need for basic improvements such as growing of spring wheat and legumes in place of mealies, clean cultivation and use of kraal manure, ash and fertilisers.

Footnote.

No demonstrators were struck by lightning and no truck was written off.

Quthing.

Rainfall 34.23in. Weather was favourable and crops fair to good. Progress in this district seems to be greatly hampered by poor communications. Areas which are served by good roads are showing much greater improvements than other areas, where the farmer still feels that he must grow food for his family rather than cash crops for sale. There is little use of kraal manure and ash on the lands and sales of supers and nitro-moncal are still low when compared with other lowland districts. However, a small increase in their use is observed each year.

There are nine co-operative agricultural credit societies, but due to misunderstanding and lack of transport and storage only six could be supplied with seeds and fertilisers. In future it is hoped that the credit societies will be a good medium through which to demonstrate to the people the benefits which can be gained from the use of good seeds, manures and sound rotation.

Mohale's Hoek.

Rainfall 37.40in. Frost in early January caused severe damage to the maize crop in the foothills and mountains but this was to some extent offset by the excellent crop of winter wheat, which, this year, was grown on a much greater acreage than previously. Many farmers neglected their poor crops of maize in order to make sure of harvesting the wheat.

19 New progressive farmers were enrolled, bringing the total to 27, farming 234 acres of land. Seven agricultural credit societies were formed

with 102 members and 667 acres planted with the aid of loans. Progressive farmers and credit society members are keen and willing to take advice, forming a very useful nucleus of improved people who will act as an example to other farmers. Development of the training farm is now almost complete and livestock, garden and crop rotation are well established, with regular farmers' days and school visits. A report on Taung will be found elsewhere in the Annual Report.

There has been a more than four fold increase in cattle imports which exceeded exports by a factor of 4.

An alarming increase in bastard rams was noted and the lamb crop is estimated to be 60 to 70 per cent. crossbred. If farmers persist in keeping bastard sheep and goats the vast improvement in wool and mohair during the last thirty years will soon be lost.

Mafeteng.

Rainfall 27in. The maize and sorghum crops were fairly good and legumes and wheat excellent. The average of peas, beans and wheat increased in the 1959/60 season and even more legumes have been planted for the 1960/61 season. There has been a vast increase in sales of superphosphate from 222 pockets to 3,569, but there is still very little use of kraal manure and ash in this district.

There are 28 progressive farmers cultivating 173 acres of maize, 76 acres of wheat, 75 acres of beans, 52 acres of sorghum and 25 acres of peas. One farmer realised £100 from sale of his vegetable garden produce alone and two or three others are obviously farming at a profit and beginning to keep records of sales. A wider variety of vegetables is sown in Mafeteng than any other district.

There were 13 credit societies farming a total of 2,000 acres of land. These appear to be successful and numerous applications are being received for the formation of new societies; any further increase, however, would put a considerable strain on the district agricultural staff.

SECTION II

AGRICULTURAL EDUCATION AND PUBLIC RELATIONS

1. AGRICULTURAL SCHOOL

Submitted by C. M. K. Seape, Acting Agricultural Education Officer.

Staff

This is the sixth year of the institution's existence. The staff consists of the Agricultural Education Officer, three full time teachers, one boarding master and six officers from Maseru, all of whom lecture in their respective fields.

During the period April to December Mr Kotsokoane, the Agricultural Education Officer, was absent on a travel scholarship to America. His place was taken by Mr Seape.

Students

The Fourth Graduation Ceremony took place in April, 1960. Eighteen men were presented with their Diplomas by Chief Leshoboro Majara, the Member for Agriculture in the Executive Council. The Senior District Commissioner, Mohale's Hoek, Mr R. Snowden, delivered the graduation speech. All but three of the diplomates were absorbed into the department as assistant demonstrators.

The new term started on 30th May, 1960 which was a week earlier than had been intended. The purpose of this early opening was to give the students the opportunity to attend the Basutoland Central Agricultural Show which was held on the 31st May and 1st June. This enabled the students to take part in the organisation and running of a show, part of their training for the work they will be expected to carry out when they leave the school.

The new term started with thirty-seven students. This was a particularly difficult term in that practically all members of staff including both the Principal and the Boarding Master were new. The period itself was charged with political unrest following upon the granting of the new Constitution and the election campaigns by the various political parties. Nevertheless, the school registered progress both in and out of the class room.

Disturbance

A minor disturbance broke out in the school in July. This was only a manifestation of the under current that had been going on among the students mainly at the instigation of certain elements outside the school. All attempts to play this trouble down failed and after very careful consideration by the school authorities, the Director of Livestock and Agricultural Services and even members of the Executive Council, it was decided to close the school ten days earlier than scheduled. No examinations were written at the end of the August term. All but nine students were re-admitted and four new ones were taken in almost immediately.

The atmosphere has since been most peaceful and the students settled down to some real hard work which was very pleasing and encouraging. The roll at the close of the year stood at 30.

Applications and Interviews

In all 144 applications were received for admission to the school for the year 1961/62. The majority were from people with Form B and awaiting Junior Certificate results. Eighteen held Std. VI certificates. As Junior Certificate is the entry qualification for the Agricultural Diploma Course at the school those below this level of education were advised to continue their studies in order to qualify for entry at a later date. There were twenty-four applications from the Union and the other two High Commission territories. Interviews with prospective students in Basutoland were spread over the period 7th to 29th December, 1960. The final result was that forty-nine students were accepted for the financial year 1961/62, including two from Swaziland, one from Bechuanaland Protectorate and one from the Union of South Africa.

Pre-instructional Training of Students

The pre-instructional period has been extended from three to six months. More than two-thirds of this period will be spent by the students at the three training farms at Maseru, Mohale's Hoek and Leribe. At these farms students will be acquainted with farm routine and activities. One-third of this period will be spent in the field with Agricultural and Livestock Officers.

In-Training

In conformity with the extended pre-instructional period mentioned above the school year has also been altered, to bring it into line with the agricultural year as opposed to the calendar year. The new term will thus start in September as opposed to June. There will be two holiday periods during the year; a longer one during winter or early spring and a shorter one during December.

There has been little change in the subject matter taught during the Report year. Three minor changes were introduced in the actual teaching matter. Extension Methods, Elementary Farm Economics and Farm Accounts being introduced. These brought a new element into our training, the financial and bookkeeping side as well as the commercial concept in agriculture.

School Units

Major changes were introduced at the four agricultural units at the school. These units are essentially investigational and also act as training ground for students. Each of the four units consists of 6 acres arable and a 25-acre share in 100 acres of communal grazing. The grazing remains the same and so does the system of rotation but the four units have been reduced to three as a result of the following changes:—

The fresh milk and butter production units have been combined into one unit. These are essentially one and no justifiable reason could be found for their separation into two units. Only minor adjustments need be made should a dairy farmer desire to produce milk in preference to butter and vice versa, but the farming system of both will remain essentially the same; hence their being brought under one unit of 12 acres. The poultry and egg production unit has now been turned into a beef and fodder unit, with the object of producing fodder and supplementary feeding for stall-feeding and then selling stock in prime condition on the best market.

The crop production unit will be continued. The sheep which had played very little part in this unit in the past have now been eliminated and in their place the crop farmer may go in for fodder production or utilise his surplus maize during winter months and stall-feed one or two beasts as a side line

for the store cattle, marketing in September-October and thus bringing in some extra cash. The investigation will be based mainly on the feasibility and economics of such an undertaking by the crop farmer. There is no doubt that the results obtained will be most valuable for the people of Basutoland and others in similar circumstances.

Much use is made of these units as a means of demonstration when courses for progressive farmers are held. They are also of particular interest to visiting farmers and others who may call at the Maseru Experiment Station, particularly when it is remembered that the units are run entirely by students and that only animal traction is used. The standard of farming on these units is much higher than that of the best farmers in the Territory. At the same time it is pointed out that this standard is capable of being attained by all. One criticism against the units has been that little money has been allocated to their running in the past. This has tended to limit the scope of investigations to a certain extent and the units have become a little unrealistic. Another problem has been the keeping of accurate records of labour, etc. used on the units. This has not been easy because of staff shortages and possibly lack of proper planning.

The units have been placed under a committee which is responsible for seeing that the broad principles are carried out, but the actual running and general supervision remain in the hands of the Agricultural Education Officer as chairman of the Unit Sub Committee.

A unit supervisor in the person of a well qualified and highly practical demonstrator is to be appointed. This man will supervise and organise work in the units and keep records of labour, material and money spent. It has been found impossible for the Agricultural Education Officer with his many duties to cope adequately with this sort of work.

Alterations and further developments in unit headquarters have been discussed by the sub committee. They are all in line with the changes and developments mentioned above. These recommendations have been accepted and will be implemented as soon as approval of estimates has been received.

Courses

Four courses were held during the year, in May and September. The first was a men's course attended by 31 selected men from all over the Territory and this was followed by a women's course at which 30 attended. The next series of courses was in September, when 27 women and 28 men attended. Subjects were mainly agricultural but varied to suit the particular sex of the group concerned. Consequently women had needlework lessons, cooking, pattern cutting, washing and preparation and preservation of vegetable and other feeds. Courses usually last for five to seven days, for which a sum of 25/- per individual is levied. The money covers free transport to and from districts, food and accommodation.

Grass and Legume Nursery

It has not been found possible to continue work in the Grass and Legume Nursery during the year. Reduction in the labour force contributed largely to this. As a result no new grasses, legumes or clovers were put in.

Social Activities and Entertainments

Football remained extremely popular throughout the year, and the Farmers' Team became widely known for its skill, being much sought after by other teams wishing to measure their worth at the game.

A new tennis court was laid out and built entirely by the students in their spare time. Certain members of staff, including the Farm Manager, assisted materially in this project. The court has contributed considerably to the high standard of tennis which is building up here.

Regular bi-weekly film shows were arranged for students during the year.

Week-ends provided a regular round of social entertainments, debates, addresses and other forms of social activities for the students, as well as a form of social education. One mixed social evening was arranged to which nurses and female students from other schools and colleges were invited. This proved an unqualified success. A prominent feature of the week-end social activities is the indoor games, a sum of well over £15 having been spent on equipment. Much has indeed been achieved but much remains to be done in this connection.

The last term of the school ended on the 16th December, 1960 with 30 students on the roll. The school is being gradually improved to meet the demand for more qualified personnel in the field. About 50+ students have been accepted for the year 1961/62. The roll will eventually stand at between 70 and 80 students, as against 30—40 in previous years.

Visitors and Visits.

The more important visitors to the school are shown under departmental "Visitors and Visits" but in addition to these the school has been visited by members of the District Councils of Mafeteng, Mohale's Hoek and Quthing, as well as by individual farmers and others interested in agricultural education and by organised groups of both adults and school students of various ages.

During the year under review the Agricultural Education Officer visited the following schools: Hlotse Secondary School, Peka, Sacred Heart, St. Agnes Secondary, Christ the King, Roma, Mafeteng Secondary, Holy Cross and Masitise Secondary School. He also gave a series of talks on agriculture, the work of the Department of Agriculture, training at Maseru Agricultural School, scope for employment, etc. All district headquarters were visited for the purpose of interviewing prospective students for the year 1961/62. The Agricultural Education Officer also visited the Basutoland Teacher Training Colleges to assist the examining body of members of the Education Department in their practical agricultural examination.

2. PUBLIC RELATIONS

Submitted by J. Presswood, Public Relations Officer.

Public Relations Van

During the year there has been a great expansion in the Public Relations Section of the Department. Much time and thought have been given to the purchase and making of equipment suitable for a long series of campaigns in all the districts which are accessible by road. A Taunus 12-seater bus has been purchased, and this is now equipped with a two kilowatt portable generator and cupboards to hold the 16 mm. cine projector, tape recorder, public address equipment, colour slide projector, cameras, tripods, screens, small library, etc. The Shell Chemical Company has kindly provided photographic display stands for use on campaigns. A reflex screen is being made, which will make it possible to project colour slides and possibly films in broad daylight.

The first campaign was held in December on the important subject of stalk-borer control. Seventeen demonstrations were given in four lowland districts, and, mainly as a result of this, it is understood that sales of insecticides have increased several fold. In addition valuable experience in organising campaigns was gained.

The preparatory work on the Van will be completed early in 1961, and the Section will then be in a position to tour the country for about 35 weeks each year giving talks and demonstrations on agricultural topics of major importance.

Workshop

A small workshop at Headquarters has been equipped with basic carpentry tools and drawing aids. Fittings for the Van have been made here and 80 notice boards bearing slogans urging farmers to use good seeds, manure, fertilisers and insecticides are now being produced. Posters, drawings, wall stencils and flannelgraphs, etc. appropriate to each campaign will be made, though the number of these may be limited until it is possible to employ a versatile handy-man on this work.

Photography and Film Shows

Many black and white and colour photographs are being taken. These will be for sale and display on Shell Chemical display boards or for projection during campaigns and evening shows. Three cine films have been taken in Basutoland and in the coming year a further 2,000ft. of film will be taken. In future all films will be exposed at sound speed and a Sesotho commentary recorded on a magnetic stripe. The United Kingdom Information Office has offered to supply new copies of certain agriculture films on permanent loan. These will be striped and a simple commentary in Sesotho recorded. Film shows (standard U.K.I.O. Documentaries and locally made films) have been given regularly at the Agricultural School and, during the last six months, in woolsheds and Community Halls in the districts from time to time.

Publications

Nine agricultural bulletins were produced during 1960 and in the latter half of the year the circulation of these was stepped up to 15,000 copies. The bulletins, on topics of current importance, are distributed to farmers, schools and the local press. In recent months no other material has been sent to the newspapers but as there is a demand for articles by editors, a new series for the press will be started. It is proposed to publish about 300 copies of a Basutoland Agricultural Note Book in which will be summarised the present departmental advice to farmers. Preparation of this note book is already under way. The book will be in a loose leaf binding so that it can be constantly revised by re-issuing certain pages. At first this will be for the use of agricultural demonstrators, but it is envisaged that the book may later be put on sale to literate farmers. The Basutoland Farmers Journal—3,000 copies published once each year in both English and Sesotho—is now in the final stages of printing, and will be on sale by the end of March.

Conclusion

Considering the limited funds available, a considerable expansion in the Public Relations Section has occurred during the year. The appointment of an Agricultural Extension Officer at the beginning of 1961 will enable the section

to increase those of the earlier services which had to be cut down during this development period. In the near future the section will be able to settle down to routine work and contact with the farming population will increase enormously.

3. LIAISON WITH PARAMOUNT CHIEF

Submitted by Chief Ntseke J. Molapo, M.B.E., Administrative Assistant to the Director of Livestock and Agricultural Services.

Relations

Early in the year there was a change in the Paramountcy at Matsieng. Prince C. Bereng Seeiso took over the reins of chieftainship from the Regent Chieftainess, 'Mantsebo Seeiso. This change did not in any way alter the good relations which have long existed between the Agricultural Department and the office of the Paramount Chief.

The new Paramount Chief is showing great interest in the development of agriculture and is doing all he can to assist the Department in encouraging his people to adopt better methods of agriculture. Since his assumption of office less than a year ago he has taken long treks on horseback into the mountains and travelled in the lowlands to see conditions for himself.

The new constitution of the country provides for the transfer of certain powers from the Chieftainship to District Councils in respect of certain agricultural matters such as maintenance of soil conservation works, eradication of noxious weeds, etc. This change has brought with it considerable confusion owing to different interpretations and misunderstanding of the constitution by some of the parties concerned. However, the constitution provides that the present rules and orders regulating these works shall remain in force until they can be revoked or amended by District Councils. The Administrative Assistant has had to pay visits to several chiefs and headmen to explain the position to them. These chiefs and many others are reluctant to carry out their former duties because relations between them and their district councils are often far from cordial owing to the incorrect interpretations of the constitution in many instances. In several areas, however, the Administrative Assistant has succeeded in inducing chiefs and headmen to continue with eradication of noxious weeds, especially along the border between Basutoland and the Union, and also with maintenance work. It is of the utmost importance for District Councils and chiefs to realise that it will only be through close co-operation and understanding between themselves that good results can be achieved in the functions allotted to them by the constitution.

The Administrative Assistant is at present engaged in touring the districts in an endeavour to bring about this essential co-operation between the Councils, chiefs and the Department.

Bastard Sheep

The increase of bastard sheep and goats in Basutoland is reaching alarming proportions. This has to a great extent been caused by the constitutional changes referred to above and also as a result of extravagant promises which were made to the people by some politicians at the time of the election. Our wool and mohair industry which has been built up to its present high level over the past twenty to thirty years is now in real danger. This has been and is being brought to the notice of District Councils by the Administrative

Assistant in his district tours with a recommendation that a full scale campaign be launched against possession of bastard rams in all districts by castrating them on the spot, as was the practice some years ago.

Thite (Virgin) Lands

The opening up of thite lands continues apace in the mountain areas. Here too political pressure by some people has been brought to bear to make the position worse. The matter has been brought to the notice of the Paramount Chief who has promised to take action through the members of the Executive Council associated with the chieftainship and agricultural affairs.

In his tours in the northern districts of Leribe and Butha Buthe the Administrative Assistant has received many complaints from Basuto farmers that they are unable to grow winter crops such as wheat and peas because these crops are damaged by animals which are let loose and roam about unattended day and night during the winter months after the main crops of maize and sorghum have been harvested. The matter has been taken up with the chiefs and the District Councils of these districts and they are considering steps which might be taken to put it right. This pernicious practice hinders development of agriculture by proper rotational crop farming at all seasons.

Other Activities

(a) During the year under review the Administrative Assistant helped in persuading the Paramount Chief and the College of Chiefs to settle the boundary dispute between the two Ward Chiefs in the Butha Buthe district mountain area. This disputed area is at the site of the proposed Ox Bow dam, where vital information and data are being collected, and the dispute threatened to interfere with this important work. Some considerable headway has been made in hearing the case and inspecting the area by the Standing Committee of the College of Chiefs, who have been accompanied by the Administrative Assistant each time they visited Butha Buthe in connection with the case. The matter will soon be finalised. Meanwhile, the Paramount Chief has issued an order to both disputants that the work of the Department should not be interfered with and should proceed unhampered.

(b) The Administrative Assistant attended several meetings of the committee of the Taung Rehabilitation Scheme and also public pitsos where problems affecting the scheme are discussed and resolved.

(c) Other activities were weekly lectures at the Agricultural School on customary law and practice affecting the use of the soil and agriculture, addresses to meetings of progressive farmers and to field staff in various districts; also consultations with several District Councils' agricultural committees.

SECTION III

AGRICULTURAL EXTENSION WORK AND OTHER ACTIVITIES.

1. PROGRESSIVE FARMERS.

The Progressive Farming movement initiated by the department in 1958/59 made steady progress throughout the year under review. The movement is already proving to be a strong motivating force for the development and improvement of agriculture generally in Basutoland. To convert subsistence cultivators to commercial farming is no mean task: it demands faith and enthusiasm on the part of the extension worker which has to contend with and overcome the suspicions and conservatism of the cultivator before his confidence can be gained and the seeds of improvement sown. Nevertheless, the very positive achievements and advances made in the past year by established progressive farmers have indicated their capacity to change, and their ability to accept new techniques when there is something to be gained by doing so.

The movement (for a full description see the Annual Report for 1959) with the simultaneous supply of credit facilities is having a decided impact on rural development, especially in the lowland areas. Its expansion is at present limited by the availability of suitably qualified extension staff who are capable of advising the farmers. However, this has had the effect of increasing the prestige of the movement and encouraging the competition of farmers to obtain the coveted Progressive Farmers badge and certificate. It is reported from one district that ordinary farmers approached demonstrators and "solicited" to be made progressive farmers.

The policy of the movement is to encourage mixed farming in the lowland areas, with specialisation on vegetable growing and poultry and egg production where suitable markets exist; while in the mountain areas the emphasis is on wool and cattle production. During the year more attention has been paid to mountain farmers in the Maseru, Mokhotlong and Qacha's Nek districts — Maseru district has 50 such farmers out of a total of 132 registered progressive farmers.

Records of production for all farmers are maintained and the following figures are of interest. (See following page.)

These figures show the diversity of cropping practised by farmers in comparison to the virtual monoculture of maize practised by the subsistence cultivator in Basutoland. Also the extent of the growing of winter crops by lowland farmers is indicated by reference to the wheat and pea acreages planted in all districts, except Maseru, where these acreages are exaggerated by fifty mountain farmers who grow wheat and peas as summer crops. On the other hand Mokhotlong district farmers, all situated at elevations over 6,500ft., show a tendency to plant excessive quantities of maize in relation to wheat and peas which are very much more suited to mountain summer conditions than maize.

The increase in the acreage under cultivation per farmer in the last year has been mainly due to the sowing of increased acreages of winter wheat and peas which farmers are being actively encouraged to plant as cash crops.

PROGRESSIVE FARMERS MOVEMENT

District	Number of Farmers Enrolled			Total crop acreage* under Cultivation			Acreage under cultivation per Farmer*			Crop Acreages under Cultivation 1960						
	1958/1959	1959/1960	1960/1961	1958/1959	1959/1960	1960/1961	1958/1959	1959/1960	1960/1961	Maize	Sorghums	Beans	Wheat	Peas	Potatoes	Others G.nuts
Butha Buthe	10	10	60	96	115	556	9.6	11.5	9.3	257.8	121.5	37.5	71.0	63.3	2.3	2.8
Leribe	68	73	79	330	464	562	4.9	6.4	7.1	310.5	54.9	68.2	68.2	56.0	2.3	1.0
Berea	41	47	82	236	557	1039	5.8	11.9	12.7	666.5	91.0	143.8	57.0	69.0	10.8	G.nuts 1.8
Maseru	—	106	132	—	744	881	—	7.0	6.6	229.9	113.3	14.0	276.2	167.5	11.4	29.0
Mafeteng	—	16	28	—	157	409	—	9.8	14.6	173.3	52.2	75.2	76.1	25.4	7.1	—
Mohale's Hoek	8	8	27	52	50	234	6.5	6.3	8.7	Not Available						
Quthing	—	51	31	—	263	345	—	—	11.1	152.3	96.5	37.3	27.3	19.0	7.3	—
Mokhotlong	30	21	27	116	202	164	3.9	9.6	6.0	95.8	3.8	1.0	50.3	5.3	6.8	barley 1.0
Qacha's Nek	19	21	21	—	—	171	—	—	8.1	Not Available						
TOTAL	176	353	487	830	2552	4361	4.7	7.2	9.0	1886.1	533.2	376.8	626.1	405.5	48.0	35.6

* Includes acreages of both winter and summer crops in lowland areas where double cropping is practised.

The table shows that the average acreage of crops cultivated per an num per farmer has increased from 4.7 to 7.2 to 9.0 acres over the three year period. The increase from 4.7 to 7.2 acres in the first two years is attributable to the fact that initially farmers were enrolled if they accepted the scheme for the improvement of one land only. Since early 19 60 farmers in the movement have had to be prepared to effect improved methods on all their lands under cultivation. Also with the encourage ment and emphasis being placed on the importance of winter cash crops, larger acreages of peas and wheat are being sown each year which in creases the acreage under cultivation per farmer.

Although accurate records of income and expenditure are as yet not available, it is a poor progressive farmer who does not net £100 per annum in addition to his subsistence food requirements. During 1961 farmers will receive instruction in the keeping of simple farm records including income and expenditure records.

In conclusion it can be stated that 1960 was a year of marked progress by the established progressive farmers, who by their example are already markedly influencing agricultural methods in their immediate surrounds. Any tendency to expand too rapidly has been guarded against, with the result that farmers are receiving adequate attention and supervision ensuring sound farm development.

2. AGRICULTURAL TRAINING FARMS.

Three Agricultural Training Farms of approximately 6 acres of arable land each, situated at Leribe, Maseru and Mohale's Hoek, started in mid 1959, were further developed during the year. The purpose of these farms is firstly to train departmental untrained staff in the skills and organisation of small scale agriculture. Temporary Assistant Demonstrators undergo a three month training course, and in future agricultural trainees will complete a six month practical training course before entry to the Agricultural School at Maseru at these centres. The farms will also be used for short courses for farmers and farmers' wives when fully developed: at present regular farmers' days are held at all three centres.

A futher function of the Training Farms is the incorporation of new techniques on a field scale, and simple investigations into the economics of small scale and specialised branches of farming, especially vegetable and egg production.

These farms came into their first full year of operation during 1960, although development is still being undertaken, and the following figures give some idea of the activities of the farms.

	No. of T.A.D.'s Trained	No. of Farmer's Days held	Total Attendance at Farmer's Days	No. of Visiting Individual Farmers	Visits by Schools	No. of Visiting District Councillors
Leribe	15	3	63	72	6	12
Maseru	14	12	423	3	5	13
M/Hoek	15	5	Not Recorded	Not Recorded	6	10

At the Maseru farm investigation into the production of vegetables for the town market has yielded some interesting data. Investigational vegetable plots totalling 1,000 square yards in extent produced a cash income of £52 during 1960, which can be considered very satisfactory under dryland conditions — water was only available for setting transplants and not for general irrigation purposes throughout the winter.

Additional accommodation is being constructed so that farmers' and farmers' wives' courses may be held at the farms.

In-Service Training.

Short courses for agricultural field staff generally of three days duration were held quarterly at all district centres except Mokhotlong and Qacha's

Nek, where two courses were conducted. These courses are primarily concerned with extension methods and departmental policy.

3. AGRICULTURAL CREDIT.

The provision of supervised agricultural credit facilities to progressive and potentially progressive farmers were greatly expanded during 1960. The Department's Extension Staff in conjunction with the Registrar of Co-operative Societies Staff were responsible for guiding the growth of the Agricultural Credit Society movement. The policy has been to keep societies small with a membership of between ten and twenty-five to start with, thereby reducing the risk to the society of defecting members, which is also a convenient number to supervise from the agricultural and business education points of view. With these considerations in mind the Leribe Credit Society which had been formed in the previous year with over 200 members was split up into 16 smaller societies scattered throughout the district.

In all districts rapid expansion in the growth of societies took place which has severely taxed the resources of both departments. Nevertheless, it has been possible on the agricultural side to effect a fair amount of supervision: all members have had their lands measured by agricultural demonstrators, each society having its own assistant or temporary demonstrator to assist with agricultural advice. Members and committees have also been personally advised on cropping and fertilizer and seed requirements by demonstrators. A fair measure of confidence has now been established between Committees and the Department's Extension Staff — however the education of committees and especially Secretaries in business methods is still an urgent requirement if societies are to develop into successful organisations.

The limited amount of credit made available for the 1959/60 summer season of £3,500 to Societies in the Teyateyaneng, Leribe and Butha Buthe areas was recovered with the exception of £700 lent to the Machobane group (which is government guaranteed), and £150 to the Leribe Society, which because of the splitting up of this large society has complicated the business of loan collection. However, it is expected that the entire amount will be fully collected. Ignoring the defection of the Mochabane group the position of loan repayments has been satisfactory.

Approximately £25,000 was made available by the Basutoland Co-operative Banking Union for short term credit purposes during the 1960 winter and 1960/61 summer cropping seasons. Of this amount £3,000 was utilized for winter crop loans and £19,000 for summer loans, the balance not being taken up. This supply of credit has so far only been issued for short term requirements such as seeds, fertilisers, and insecticides, which experimental work has proved give an economic return, provided that the appropriate varieties of crops and optimum quantities of fertilisers are used. There is, however, a need for longer term credit facilities to provide for farm development in the way of implements, livestock, buildings and fencing materials. If short term loan repayments are satisfactory in 1961 attention will be given to the provision of medium and longer term loan facilities for established farmers.

The following table shows the present position in regard to societies, membership who received credit, total acreages cropped by members, and the issue of fertilisers:

CREDIT SOCIETIES

DISTRICT	Number of Societies		Members in receipt of credit	1960/61 Total acreage under cultivation*	1960/61 Average acreage per member*	Fertilizer Issued	
	1959/1960	1960/1961				Superphosphate (tons)	Nitromoncal (tons)
Butha Buthe	5	16	294	1,705	5.8	91.7	3.5
Leribe	1	24	584	3,495	6.0	208.2	1.75
Teyateyaneng	1	6	306	3,343	10.9	107.1	Nil
Maseru		17†	244‡	1,623	6.7	222.0§	1.2
Mafeteng		13	191	2,000	10.5	148.0	0.4
Mohale's Hoek		7	102	667	6.5	44.1	Nil
Quthing		9	117	949	8.1	11.1	1.25
Qacha's Nek	—	—	—	—	—	—	—
Mokhotlong	1	1	75	385	5.1	Nil	Nil
TOTAL	8	96	1,913	14,167	7.5	832.2	8.10

* includes both summer and winter crops planted in lowland areas where it is possible to grow two crops in one year.

† Only 12 societies functioning although 17 registered.

‡ Membership of 12 societies.

§ Two members, the Paramount Chief and a share cropper received loans for 25 tons fertilizer each, while several share croppers received loans for large quantities.

The marketing of credit societies farmers' crops has been done through the Basutoland Co-operative Federation Limited who are also responsible for supplying seeds, fertilisers, insecticides and other agricultural requirements, or by co-operative marketing societies where they exist.

It is estimated that the input of £22,000 of credit for seeds, fertilisers and insecticides will result in an increased gross return to farmers of between £50,000 to £60,000 or an increased net return of £28,000 to £38,000.

4. MACHOBANE AGRICULTURAL SYSTEM.

During the year Mr Machobane was absent for a period of months. During this time he and his wife visited the United States of America under the auspices of the Ford Foundation Travelling Scholarship Fund. During his absence the enthusiasm of his followers appeared to flag, while both his college and farming system declined in efficiency. In fact many erstwhile Machobane followers became members of co-operative credit societies.

The experiments, comparing formal agricultural methods with those propounded by Mr Machobane, also received a setback because of his absence. His followers left in charge while he was away seemed incapable of making decisions and as a result difficulties which arose over the running of the experiments were never resolved.

Since his return from America Mr Machobane has stated his intention of building a large agricultural college but wisely avers that there should be the closest co-operation between the department and himself in planning such an operation.

There is no doubt that he has received considerable support both financial and moral for his ideas and that if a working solution can be found which permits a combination of his undoubted ability to get his views over and the rationalisation of those views, then he will achieve much and in the process benefit the farming community.

4. TRACTOR HIRE SYSTEM.

Both the Mechanised Group Farms and the Pilot Project Colonial Development and Welfare schemes ceased to function. The Mechanised Group Farms' scheme had commenced closing down in 1959 but formalities were not completed until 1960.

Tractors and equipment which resulted as a surplus from the closure of the schemes were disposed of as follows:

(a) To Co-operative Societies.

(b) To Agricultural Department.

Of the agricultural societies only one at Tsikoane has continued to work satisfactorily. The remaining societies because of their inability to function, despite assistance given to them, have had the tractors and equipment withdrawn.

One co-operatively organised hire group was initiated but owing to a lack of organisation on the part of the group and the poor state of the tractors and equipment taken over the scheme had to be closed down almost before it started.

There is no doubt however that there remains a keen demand from the wealthier Basuto for the use of tractors and ploughs during the planting season.

5. TRADING ACCOUNT

In January 1960 it was decided that the management of the Trading Account, which since its inception had been run by the department, should be handed over to the Co-operative Department. At the same time it was considered advantageous to both departments that the officer seconded from the Agricultural Department to Co-operatives should remain and continue to keep an eye on all agricultural interests affected by developing co-operative activities.

A detailed report from this officer is included under section 10.

There is no doubt at all that the development of credit societies, closely associated as they are with the Progressive Farmer movement, is doing much to improve peasant farming.

6. MASERU EXPERIMENTAL STATION.

Consisting of 660 acres, the station lies about two miles north of Maseru, and is flanked on the east by the Caledon River, which is the boundary between the Orange Free State of the Union of South Africa and Basutoland.

The station which was started in 1952 is the centre of Agricultural Research in Basutoland. The main station, with the six sub stations situated at Leribe, Teyateyaneng, Machache, Mokhotlong, Matsieng and Mafeteng, allow for research to be carried out on all the main soil types in the Territory and under the different climatic conditions occurring in the lowlands, foothills and mountain zones.

The three main sections of the station are Research, the Farm and the Agricultural School.

Staffing.

Senior staff consists of the Agricultural Research Officer in Charge, the Agricultural Education Officer and the Farm Manager. Junior salaried staff including teachers number 10. The labour force is seasonal and varies from twenty to sixty.

For most of the year the Agricultural Education Officer, Mr J. R. L. Kotsokoane, was on study leave in the U.S.A., Canada and the United Kingdom. While he was away his duties were carried out by Mr C. M. K. Seape who was brought from Mokhotlong to act in his stead. In June the Farm Manager, Mr A. H. Gibson, was promoted to Senior Agricultural and Livestock Officer and remained at the station to carry on his good work.

The following staff changes took place:— Demonstrator T. Molemahang was transferred to Mohale's Hoek, while Demonstrator M. Masilo replaced him on transfer from Leribe. Clerk E. Mosocane was transferred to Teyateyaneng and Clerk O. Sefake replaced him at the station. The Boarding Master, Mr C. A. Motsamai, left to become an interpreter to the newly formed Legislative Council and Mr J. Nthongoa from Headquarters replaced him as Boarding Master. The Farm Foreman, Mr S. Kabi, was selected to undergo special training as a veterinary assistant. At the end of the year he had not been replaced. The temporary Laboratory Assistant, Mrs A. Macintosh, ceased working at the end of June and by the end of the year no one had been found to fill the vacancy.

Messrs E. Chobokoane and S. Mtombeni joined the staff of the Agricultural School.

General.

Two prefabricated houses, previously used at the Pilot Project near Teyateyaneng, were re-erected at the Station for housing senior staff of the department. They are occupied by the newly appointed Animal Husbandry Officer and the Field Extension Officer. For the housing of junior staff and labourers one Junior Type D house, one double rondavel house and four single rondavels were built.

An incubator room and egg room were built on to the existing brooder house and the incubator previously housed in Maseru was then moved to the station.

During the year the Meteorological Station was moved from Maseru to the Experimental Station and is under the control of Mr A. H. Gibson who acts as Meteorological Officer. Synoptic weather reports are sent twice daily to the Weather Bureau in Bloemfontein.

Research and Investigation.

The large programme of Experiments and Crop Investigations was continued at Maseru and the six district sub stations. Results are summarised below. Full details of the year's results are given in Part III of the report. This consists of an up-to-date review of all the research that has been carried out at this station since its inception.

(a) Variety trials on Maize, Wheat, Beans, Cowpeas, Peas, Sorghum and Sunflower were continued at Maseru, Machache and Mokhotlong.

Seed of the eight most promising mountain wheat varieties was sold to farmers for the first time. The station is now in a position to make firm recommendations regarding the most suitable varieties of Maize, Wheat, Beans and Peas for the various ecological zones of the Territory.

(b) **Fertiliser trials.**

These include N.P.K. experiments, spacing experiments and experiments comparing rates and types of phosphatic and nitrogenous fertilisers and manures, as well as crop rotation experiments.

(i) **Nitrogen.** Nitrogenous fertilisers again improved yields on all sites in the lowlands and foothills, irrespective of plant populations, but responses were progressively greater at the higher plant populations.

It has been shown that Urea is equal to Limestone Ammonium Nitrate as a Nitrogenous fertiliser when applied at the same rate of N. This is of importance in Basutoland, as the lower price per lb. of N. and reduced transport costs of Urea should reduce the costs of crop production.

There were the usual responses to added phosphate and consistent N.P. interactions in the lowlands and foothills.

All summer and winter Nitrogen treatments on maize increased yields.

Eragrostis curvula as a ley continued to give progressively increased yields from increasing nitrogenous applications.

(ii) **Phosphate.** All crops again showed responses to phosphatic fertilisers. It would appear that in future phosphatic fertiliser applications to the same land should be in the nature of three years Superphosphate, 2 or 3 years Super and Raw Phosphate, followed by annual applications of Raw Rock phosphate.

(iii) **Potash.** As reported in the 1958 report, no responses to potash have been recorded, so potash was excluded from the 1959 and 1960 research programme except for the N.P.K. experiment on wheat at Mokhotlong where no responses occurred.

(iv) **Lime.** Responses to lime on foothill red loams have been recorded.

(v) **Manure and Manure Ash.** Continued to give yield increases.

(vi) **Trace Elements.** Responses to Molybdenum have again been recorded on certain soils. Further responses to sulphur have been recorded.

Boron has been shown to cause a depression in yield on one soil type. Further pot experiments with Iodine have shown marked variations in the responses of crops to it. Wheat and Peas give marked increases, Bean yields are depressed and Maize responses vary according to soil type.

(vii) Initial results from crop rotation experiments show differences between cropping systems.

(viii) After one year of comparing the Machobane Agricultural System with conventional cropping it is apparent that while there is no marked difference in yields the Machobane System requires more labour and production costs are higher per unit.

(ix) **New Crops.** Trials were conducted with Groundnuts, Castor, Turkish and Burley Tobacco and Pyrethrum, with a view to introducing these into the Territory as additional cash crops.

The Farm.

The farm maize crop was again excellent, 205 bags of white maize and 303 bags of yellow maize being harvested. Yields varied according to lands, being from 11—19 bags per acre. The low yields from one land adjacent to Maseru resulted from severe thefts of cobs. In addition 2,900lb. of field beans and 1,200lb. of sunflower seed were produced. 33¼ Tons of Lucerne hay was produced from 5.5 acres and 8 acres of Eragrostis curvula yielded 12 tons of hay and provided supplementary grazing for farm livestock. Approximately 10 tons of groundnut hay was produced and fed to stock.

Pigs. Forty-three 3-month-old piglets were bred at the station and sold to farmers. In addition the station supplies in-pig sows to the three training farms at Leribe, Maseru and Mohale's Hoek. The progeny from these sows are then sold by the training farms to farmers.

Poultry. The transfer of the incubator from Maseru to the farm has greatly facilitated poultry production. During the year 4,092 chickens were hatched, of which 2,822 were reared to 10 weeks old, when they were sold to farmers. A further 350 chickens of varying ages were on hand at the end of the year. Total deaths amounted to 920 or 22.5 per cent. made up as follows:—

In brooder house	740
In arks	119
In transit to districts	61

The high death rate in the brooder is attributable to chilling during periods of extreme cold when the heating system proved incapable of maintaining an even temperature. The use of a kerosene brooder to supplement the existing system has, it is hoped, solved this problem. In addition 23,905 eggs were sold during the year. The poultry plant showed a surplus in revenue of £181.6.6d. over expenditure.

Sheep and Goats. The Wool and Mohair Officer controls trial flocks of these which are located at the station for instructional purposes and various experiments.

Grass and Legume Nursery. This nursery, established three years ago, is used to observe local and exotic grass and legume species grown under dryland conditions. It is conducted by the Agricultural Education Officer. During the year progress was satisfactory and observations were generally the same as reported in 1959. A variety of stooling synthetic rye obtained from the Bethlehem Research Station appears to be very promising as a quick growing soiling crop.

Forestry. 635 Boxes of seedlings and 76,530 young deciduous trees were grown at the farm nursery for planting in Maseru district. The trees grown are pinus sp., cupressus arizonica and four species of populus.

The Agricultural School.

This has continued to function most satisfactorily as part of the Experiment Station. The students receive practical instruction in all aspects of the farm and experimental work.

During the year it was decided that the existing agro-economic school units in their current form were unrealistic and these have now been redesigned to provide a more practical application. While these units provide an excellent training ground for students, who do all the work on them, they are essentially investigational. For details see section on Agricultural Education.

7. LAND USE PLANNING.

Details of progress made during the year in Land Use Planning are contained in Section IV of Part II — Soil Conservation.

8. LIAISON WITH UNION OF SOUTH AFRICA CONTROL AND MARKETING BOARDS.

Contact was maintained throughout the year on matters of interest to the Territory. The need for the introduction of grading regulations is now more keenly felt since improved qualities of grain are being produced and progressive farmers naturally demand better prices for production of improved quality grain and crops. Lack of staff precludes the introduction of a full grading system but a simple internal system — "Grade 1, Grade 2 and undergrade" has been introduced by the Co-operative Marketing Societies as an incentive to better quality production; although grain and produce exported or imported were classed under the more comprehensive Union grading systems.

(i) **Maize Industry Control Board.**

(a) **Maize.** The Union subsidy to consumers of maize in the Union was 4/- per 200lb. bag, which amount had to be refunded by consumers in Basutoland. An ample supply of maize for consumption within the Territory was available, although for the second year in succession stocks were situated at supply centres in the North Western Free State, and railage from these distant centres proved an additional burden to consumers. The high landed cost of 42/- per bag of maize has encouraged local co-operative marketing societies to pay up to 36/- per bag for good quality locally produced maize. It is anticipated that this factor, together with increased production by progressive farmers, will reduce the amount imported.

(b) **Sorghum.** Exports were diposed of at the Board's "floor price" of 31/- per bag. No trouble was experienced in disposing of the crop. It became necessary during the year to agree to a contribution to the Board's Stabilization Fund of 3/- per bag on sorghum imported from the Union for malting purposes. This is likely to have the effect of making the locally produced crop much more valuable to local importers, leading to increases in production.

(c) **Beans and Peas.** See table for export figures. Beans were disposed of under the Control Board's scheme but peas are not under control. In this respect significant improvement in quality has been achieved. All seed requirements of Basuto farmers and the agricultural credit movement, previously imported, are now met from locally produced, hand-selected seed, at prices below that of imported seed. Quality is so good that Union seed suppliers have undertaken to take up any surplus seed, but the erratic prices of this crop complicate the internal price structure.

(ii) **Wheat Industry Control Board.**

Wheat seed was again imported from the Union to meet local requirements although it has become increasingly difficult to obtain wheat of sufficiently high standard. The two main varieties imported during the year were Scheepers and Spitzkop.

The Basutoland wheat crop for 1960 was again exported and disposed of under the Union Wheat Industry Control Board's marketing scheme, and no difficulty was experienced in marketing the crop. As previously, the bulk of the crop was graded as B3, valued at 53/- per bag delivered to an agent in the Union, in new grain bags. During the year consideration was given to the possibility of making use of the Basutoland crop in local milling. This gave rise to certain problems as it was commonly believed that the bulk of the Basutoland crop, being of the mountain wheat, was not suitable for milling, unless it was blended with softer wheat. It was decided that some research was necessary in order to establish the true position of a cross section of the Basutoland wheat crop, and with this in view samples were drawn from the three main wheat producing areas, i.e. the mountains, foothills and lowlands, and these were forwarded to the Union Wheat Industry Control Board who had undertaken to do comprehensive quality, baking and milling tests on these samples. At the time of this report the detailed analysis has been received and is being studied.

(iii) **Potato Control Board.**

It was not necessary to export potatoes for marketing in the Union during the past year, as the crop was disposed of within the Territory at prices ranging from 5/- to 7/6 per 37½lb. pocket.

Potato seed. In order to ensure the best possible yields for Basuto farmers, Government certified virus-free Riet River AA seed was imported, and sold to farmers at about 15/- per 37½lb. pocket. Early indications are that the seed is doing particularly well, and with the favourable climatic conditions a crop somewhat larger than that of last year may be expected.

9. LIAISON — CO-OPERATIVE DEPARTMENT.

The close association enjoyed by the Department of Agriculture and the Co-operative Department of the previous year was continued and in fact expanded during the report year. Unfortunately the Agricultural Liaison Officer was absent from the Territory on overseas leave for a

period of five months, and due to a shortage of staff in the Registrar's Office, acted as Registrar of Co-Operative Societies during the absence of the Registrar on overseas leave. This resulted in his enforced absence from the field for a period of eight months. However, the first part of the report year saw a tremendous growth of the agricultural credit movement. During this period the number of agricultural credit societies rose to 96, and expansion of the movement had to be halted in order to permit of the proper training of the committees and staff occupied in the movement as well as generally consolidating agricultural credit. An amount of £25,000 has now been made available for loans to farmers on the same system as set out in detail in last year's Report, and the amount revolves between summer and winter crops in the proportion of £20,000 and £5,000 respectively although only £19,000 and £3,000 respectively were taken up. There is considerable demand for an expansion both within the existing societies and for new societies to be registered, but it is considered unwise to allow this expansion to take place until the newly created audit system has had an opportunity of auditing the books of existing societies and so determining the full percentage of loan recovery. A system of classifying the efficiency of the various societies into four categories is also in progress; this classification aims at establishing for example what number of societies have made good use of their loans and have active committees, down to the type of society that has made no agricultural progress during the year and which has an indifferent committee. It is proposed that as soon as this survey is completed societies in the latter group will be liquidated.

10. AGRICULTURAL SUPPLY AND MARKETING ORGANISATION.

This body took over all the trading activities of the Agricultural Department's Trading Account on the 1st January, 1960, and continued the supply of agricultural requirements such as seed, fertiliser and insecticides for a period of nine months. It was managed as a quasi-Government organisation in the office of the Registrar of Co-Operative Societies pending the establishment of an independent Co-Operative Society which was established on the 1st October, 1960. It then became evident that the new organisation, .i.e. the Basutoland Co-Operative Federation, would require a substantial amount of capital in order to set it up as an independent business organisation. This has proved to be a longer process than was at first envisaged. Both the staff and capital requirements are still being attended to, but this has resulted in a most difficult period for the organisation. While the demands on the organisation grew tremendously throughout the year, as can be seen from the trading figures in the attached schedule, the seasonal crop collections and supply exercises could not be delayed, and the transitional period proved to be a most difficult time while attempting at the same time to meet the demands of the farmers. A considerable amount of experience is being gained and numerous difficulties are being overcome, but services rendered by the organisation are still very much below the volume required by the farming community.

SALES

ITEM	1958	1959	1960 A.S.M.O.	1960 B.C.F.	1960 Total
Carts	31	141	88	8	96
Vegetable Seeds	115,640 pkts	142,720 pkts	93.114 pkts	68,080 pkts	161,194 pkts
Sorghum Seed	1,800 lb.	42,000 lb.	6,359 lb.	7,404 lb.	13,763 lb.
Maize Seed	29,800 lb.	94,600 lb.	71,627 lb.	75,596 lb.	147,223 lb.
Bean Seed	3,000 lb.	14,800 lb.	12,369 lb.	58,439 lb.	70,808 lb.
Pea Seed	—	15,400 lb.	47,330 lb.	6,130 lb.	53,460 lb.
Potato Seed	43,163 lb.	75,512 lb.	20,925 lb.	50,962 lb.	71,887 lb.
Wheat Seed	18,400 lb.	50,600 lb.	75,615 lb.	360 lb.	75,975 lb.
Oat Seed	18,400 lb.	12,300 lb.	12,750 lb.	430 lb.	13,180 lb.
D.D.T. Powder	2,690 lb.	1,345 lb.	900 lb.	1,940 lb.	2,840 lb.
Dieldrin	981 ozs	2,302 ozs	3,310 ozs.	3,554 ozs.	6,864 ozs.
D.D.T. Emulsion	35 gals	173 gals	121 gals.	221 gals.	342 gals.
Seed Dressing	1,557 ozs	4,365 ozs	3,609 ozs.	1,181 ozs.	4,790 ozs.
Superphosphate	223 tons	468 tons	453½ tons	706½ tons	1,160 tons
Nitrogenous Fertilizer	1¾ tons	5½ tons	12 tons	20 1/5 tons	32 1/5 tons
Grain Tanks	—	2	7	—	7
Gates	—	11	11	4	15
Droppers	—	820	594	92	686
Standards	—	234	321	154	475
Corner Posts	—	300	264	69	333
Wire (Various)	—	69 rolls	123 rolls	11 rolls	134 rolls
Netting Wire	—	26 rolls	77 rolls	29 rolls	106 rolls

TRACTOR HIRE SYSTEM

The Co-Operative Tractor Hire System introduced last year in the area where the former Pilot Project operated was unsuccessful and ran into financial difficulties very early in the report year. Towards the end of the year the society had to be liquidated and is now in the process of being wound up. One branch of the organisation, however, that at Tsikoane's, has proved to be successful and will be expanded in order to cope with the demands of the members. It is proposed therefore to make some of the machinery available from the society under liquidation to allow this society to expand, while some of the machines will be returned to the Department of Agriculture where they will be employed on other projects.

11. AGRICULTURAL SHOWS

Successful Agricultural Shows were held in all districts except Mokhotlong and Qacha's Nek. Marakabei (in the Maseru district) held its first Mountain Show. This was well attended and was notable for the high standard of the livestock entries, foremost among which were some very fine prime oxen and Merinos. These shows continue to play an important role in the extension work of the Department, and have received active encouragement and help from all district staff.

There was a steady increase in the number of entries at all Shows over the previous year, which ranged from 200 at Quthing to 480 at Leribe. Judges also remarked favourably on the standard of quality and presentation of exhibits, which have improved considerably in the last three years, due to the stimulus of competition and the realisation of the importance of producing a quality product.

The facilities at the Central Agricultural Show Ground were much improved by Government. Improvements included the piping of water to stock pens, the expansion of existing stand space and the enclosing of the Show ring. In order to widen the interest for the public a programme of ring events was included which proved very popular. Entries exceeded 1,300 and a high standard was set in the crop, vegetable, and Homemakers classes, but the large stock entries were disappointing both in number and quality. Butha Buthe district won the Barclays Bank floating trophy for the second year running, which is presented to the district which scores the highest number of points in all sections.

The Show was opened by His Excellency the High Commissioner and His Highness Moshoeshoe II, and was well attended by approximately 3,000 people over the two days, despite the rather inclement weather.

12. AGRICULTURAL ASSOCIATIONS

Farmers' associations exist in most districts, but with the advent of progressive farmers and agricultural credit societies their activities have become more restricted. Where societies are still active they are responsible for the organisation of district agricultural shows. The most active associations exist in the Butha Buthe and Leribe districts.

It is reported that Women's Associations, including the Homemakers Clubs, are more active than their male counterparts. They are responsible for organising communal vegetable gardens, orchards and poultry improvement. In this respect there is always great competition for places at short courses run for farmers' wives at the Agricultural School in Maseru. There is no doubt that the women of Basutoland take an active interest in both agricultural matters and home improvement, and the department through its extension staff is endeavouring to encourage and develop this enthusiasm.

PART II

SECTION I

CROP PRODUCTION AND FOOD SUPPLIES

The seasons in Basutoland are, broadly speaking, as follows:

September-November	Spring	Rains commence.
November-April	Summer	Rains. Growing season.
April-June	Autumn	Harvesting. Frosts commence
June-September	Winter	Cold dry season. Hard frost.

(1) **Exports**

The following table shows the export figures for the main crops, in bags of 200lb., these being quantities of foodstuffs for which export permits (to Union of South Africa) have been issued. These figures refer to traders' exports and of course would be greatly increased if the quantity of produce taken out over the border by individual Mosuto was known.

	1955	1956	1957	1958	1959	1960
Wheat	27,575	82,114	101,077	51,741	18,344	39,348
Peas and Beans	39,677	62,943	38,608	47,300	25,904	(11,083 (2,046
Sorghums and Malts	10,168	5,643	10,003	11,864	680	5,826

(2) **Imports**

It is impossible under the new system dealing with maize imports to give any satisfactory figures at this stage.

(3) (a) **Maize and Sorghums**

1959-60. These crops promised well in the beginning but were set back by the January drought. As a result, although there was considerable leaf growth up to that stage, plants failed to fulfill their early promise and grain yields were below average both in quantity and quality.

1960-61. A good growing season throughout, with an above average crop assured.

(b) **Wheat**

1959-60. A good crop, some of which was lost by the inability of mountain people to thresh the wheat immediately after harvesting. Grain which was left in the stook started to germinate, caused by the unseasonal showers which occurred. Lowland wheat gave above average yields but continues to be spoilt by the presence of covered smut. The preparation for marketing of both mountain and lowland wheat leaves much to be desired. The percentage of foreign matter, dirt and stones in any sample is always far too high. It is hoped that the recently introduced hand operated threshers (Japanese and British manufactured) will prove successful in producing a more acceptable product.

1960-61. Mountain wheat promises to give high yields and good quality grain and straw. Lowland wheat has grown well and gives every promise of a good crop although it is expected the sample produced for sale will again be spoilt by the presence of foreign matter and diseased grains.

(c) **Peas and Beans**

1960. The crop gave average yields and again, provided it was hand sorted, commanded a good price as an export. Exports occur mainly to Natal for sale on the "Indian" market. The main varieties grown are White Haricot, Wacher and Natal yellow sugar beans, green and yellow Basuto peas.

(d) **General**

There was no indication of famine anywhere in the territory during 1960.

Crop marketing through co-operative societies is becoming more popular but still requires considerable organisation in order that markets may be obtained for produce at the time of high prices.

SECTION II

LIVESTOCK INDUSTRY.

1. ECONOMIC ASPECT.

This has been a poor year for the livestock industry. While climatic conditions have, in the main, been good and livestock have maintained condition, it has nevertheless been a disappointing year in that the hopes expressed that 1960 would see the commencement of the building up of an effective division of livestock services have not been fulfilled. The effective strength of the division has, however, been increased by the appointment of an Animal Husbandry Officer and a further six veterinary assistants are at present under training, but generally the livestock industry has made no progress during the year. Prices of our main products, i.e. wool, mohair, hides and skins, have tended to fall and in the absence of any increase in production and quality, the industry's contribution to the national revenue has decreased. With the return home of large numbers of Basotho from the Union there has been an inevitable increase in the number of livestock, particularly sheep, imported into Basutoland and whereas in the past the number of small stock exported has invariably exceeded imports this year the position has been reversed.

The adverse balance in respect of large stock has also increased and Basutoland, which climatically and geographically should be a relatively large livestock exporting country, is instead a large importer. There will have to be a complete change of heart before this undesirable trend can be reversed.

2. LIVESTOCK AUCTION SALES.

The Co-operative Department has organised a number of sales in various districts and the number of cattle and sheep sold at these sales have shown a marked increase. It could reasonably be expected that this increase in exports by the Co-operatives would be reflected in the overall export picture. In spite of this, however, the number of cattle exported has shown a decrease and it is apparent that these sales have not in any way increased exports but have merely diverted cattle which would normally have been exported through other channels. This seems to emphasise that the Basotho stock owner will only sell cattle either for cash or in exchange for tollies when economic necessity forces him to do so. All the efforts of the newly created animal husbandry section must be directed towards bringing home to the Basotho that cattle and small stock are marketable commodities and must be sold and, if necessary, replaced at regular intervals, if he and his country are to derive the full financial benefit from the livestock industry.

3. WOOL AND MOHAIR.

SHEEP AND WOOL.

"Wool growers from Australia, New Zealand and South Africa, after a week's deliberation in London, reached full agreement on a new administrative plan for the International Wool Secretariat," it was announced at the end of their meeting on 15th November, 1960. (Basutoland is a member of the South African Wool Board.) The report proceeds by

saying, "the constitutional changes provide for a substantial expansion of the secretariat's activities to enable it to meet more vigorously the challenge of **rival** fibres".

This move is of the greatest importance to Basutoland, dependent, as it is, on its wool industry. Wool is barely holding its own against rival fibres, mainly synthetic. A falling off in the popularity of wool, followed by a considerable decrease in price, would affect the economy of this Territory very adversely. Should this assumption prove correct, or only partly so, it would be the lower grades of wool which would be mostly affected. First-class wool will always be able to compete with any known fibre. In view of this, the fact that within the last two years our C.W. class (coarse, hairy and kempy) has risen from 4 per cent. to 9 per cent. of the clip takes on a very serious aspect. (See Fig. 2.)

Some of the present day Mosotho farmers seem determined to undermine the only paying industry we have by disregarding the Laws of Lerotholi, advice by the Department and plain economic facts; and persisting in breeding cross-bred sheep which produce inferior wool; this, in a country most suited to the production of the finest possible merino wool. It is difficult to find words sufficiently adequate to warn the Basuto nation of the seriousness of neglecting and failing to improve their heritage — the merino — the life blood of Basutoland and bearer of the "Golden Fleece".

Wool Clip.

The pattern of the 1959/60 wool selling season and the beginning of the 1960/61 season are shown in Fig. 1.

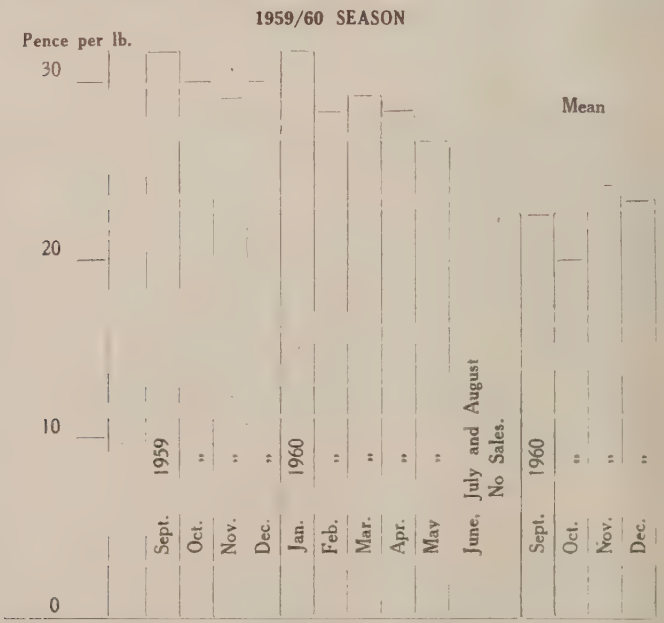

Figure 1. Showing mean monthly prices received for Basutoland wool sold by public auction at the coast.

DISTRICT EXPORTS OF WOOL DURING 1960 AS FORWARDED BY DISTRICT COUNCILS

District	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total	
BUTHA BUTHE	156012	84372	55011	20059	15221	6198	—	801	4690	21848	63322	138075	566,519	lbs.
LERIBE	201075	133502	53816	95476	80737	31194	21594	22762	38843	73881	208691	360620	1,322,191	,,
MASERU	149587	93005	52969	104217	132699	28756	25238	56014	58871	128810	283761	429777	1,543,704	,,
MAFETENG	75873	25882	66685	94543	58637	12118	2701	13969	28783	117329	129428	118371	744,319	,,
MOHALE'S HOEK	15016	13679	9055	11001	16463	4630	8853	—	1190	6065	24841	16407	127,200	,,
QUTHING	47305	18313	17136	24852	26934	12187	1917	13289	88936	130099	57598	148684	587,250	,,
QACHA'S NEK	91774	57676	19606	30964	84361	61157	30757	31175	30288	117889	71345	232001	858,933	,,
MOKHOTLONG	252013	95820	23840	22572	21482	19920	14414	18686	22308	38961	35053	471111	1,036,180	,,

GRAND TOTAL: 6,786,356 lbs.

The mean price for Basuto wools sold by public auction at the coast during the 1959/60 season was 25.87d. per lb. compared with 21.15d. in 1958/59. During the 1959/60 season the price opened at 30d. per lb. average lb. and fluctuated between this figure and 21.59d. per lb. average, never again reaching the opening price. The tendency appears downward.

Duty was paid on Basutoland wool during 1960, 6,786,356lb. worth £731,513 at the coast compared with 7,233,109lb. worth £830,903 in 1959.

A decrease of 446,753lb. As there have not been any outbreaks of disease this decrease is difficult to explain, execpt that smuggling to avoid the levy has increased.

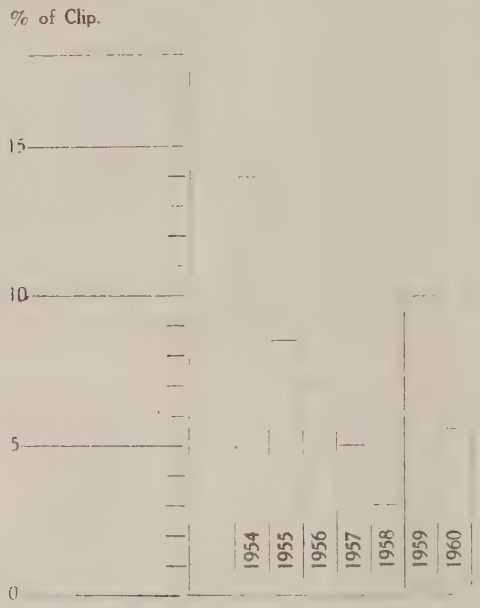

Figure 2. Incidence of hairy and kempy wool in Basutoland clip.

Since 1958, when the percentage of coarse, kempy and hairy wool was only 4 per cent. of the clip, there was a considerable jump to 9 per cent. in 1959, followed by a welcome decrease to 6 per cent. in 1960. Although this figure is most gratifying, when compared with the 9 per cent. of 1959, it is no reason for complacency, as the 1960 crop of lambs, which will be shorn in 1961, has a greater proportion of cross-breds than the 1959 crop.

The low figure of 4 per cent. in 1958 (it was 30 per cent. in 1938) was brought about by the importation and use of good quality rams and the elimination of most of the cross-breds.

Sheep Improvement.

During September, 1960, 337 very good Merino rams were purchased from top Merino breeders in the Union and resold to Mosotho farmers at subsidised rates. The quality and excellence of these rams may be assessed by the fact that all were disposed of within four months and enquiries for

more are pouring in. This brings the total of such importations up to 15,867 since 1935. Unfortunately, the improvement being brought about by these importations is being counteracted by the continued use of low class crossbred rams, which up to 1958 were being reduced in accordance with the law but which today are on the increase.

Wool from the experimental flock realised £71.11.0 and the sale of aged ewes and surplus progeny £90.15.0.

4. GOATS AND MOHAIR.

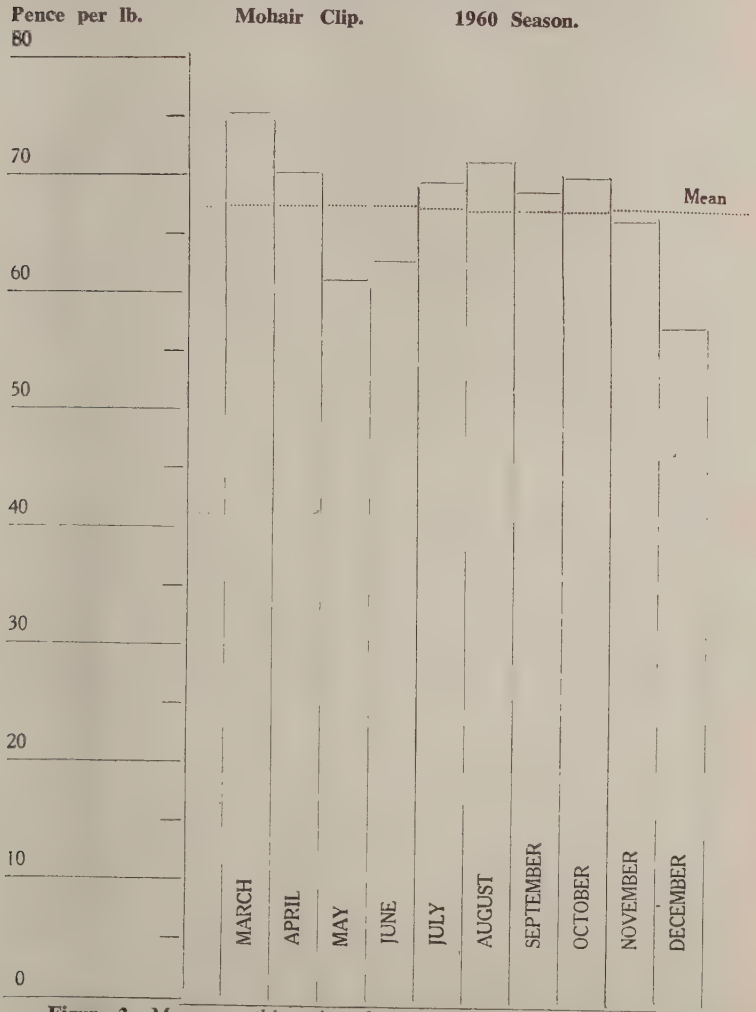

Figure 3. Mean monthly prices for Basutoland mohair sold by auction at the coast during the 1960 season.

The mean price for Basutoland mohair sold by auction at the coast during March 1960, the opening month of the new season, was 77.99d. per lb., which was 1d. below the opening price in 1959. The average price then dropped to 61.81d. per lb. in May, rallied a little in July and August to 68.42d. and 68.64d. per lb., dropped in September to 66.03d., rose in October to 68.33d., dropped to 64.53d. in November and closed at 56.04d. (See Fig. 3). The mean price for the year 1960 was 66.97d. per lb.

Known exports amounted to 1,180,670lb. as compared with 1,081,470lb. in 1959. On this basis the mohair clip realised £329,456 at the coast as compared with £371,618 in 1959.

Goat Improvement.

The small flock purchased from the annual grant of £200 from the South African Mohair Advisory Board is kept at the Experiment Farm and is found to be most useful in giving students at the Agricultural School and progressive farmers practical demonstrations. Proceeds from sale of mohair from these angoras amounted to £102. Nine kids, the progeny of the flock, were sold to Basotho farmers and realised £20.

In February, 1960, 235 angora rams were purchased from well-known Angora breeders in the Union and sold at subsidised rates to Basotho farmers. These were very good upstanding angoras and could leave their mark on the Basutoland mohair clip if it were not for the use of cross-bred Boer goats by some of the Basotho farmers, which go a long way towards offsetting the advantages obtained from the high class angoras. Total importations of angora rams into the Territory are now 2,393.

At the closing mohair sales in Port Elizabeth on 15th December, 1960, 541 bales from Basutoland were offered, this figure constituting a record.

General.

Preparation of Wool and Mohair Clips.

There has been a general improvement in the classing and get-up of wool and mohair during the year due to the increase in the number of Government trained wool/mohair classers. This was borne out by brokers at the coast on the occasion of Wool and Mohair Officers' last visit. Routine courses of instruction for Government and traders' wool and mohair classers and flock owners were held by the Wool and Mohair Officer throughout the Territory at the beginning of the respective seasons. Government wool and mohair classing instructors were also given refresher courses.

Lectures.

The Wool and Mohair Officer gave the usual lectures and demonstrations to students, progressive farmers and staff at the Maseru Agricultural School. Further talks were given to district councils in the district. The lack of knowledge of some members of district councils in regard to wool and mohair generally is surprising.

A system similar to the Progressive Farmers' scheme is being put into practice for sheep and angora farmers. This scheme is closely associated with that of the Progressive Farmers, which aims at encouraging and helping the man who is sufficiently interested in improving his lot.

The biggest buyer was again the United Kingdom, followed by Japan, France and Italy. It is noteworthy that China is buying much more wool than ever before, her purchases being up 200 per cent. on the 1959 figure.

DISTRICT EXPORTS OF MOHAIR DURING 1960 AS FORWARDED BY DISTRICT COUNCILS

District	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total	
BUTHA BUTHE	824	1215	1708	5136	2673	43003	9498	12092	6764	4418	6833	859	95,023	lbs.
LERIBE	4729	1989	4610	8545	29631	49649	38572	29941	13404	12072	10569	11973	215,684	,,
MASERU	5597	6423	8691	22573	43647	59391	37263	25915	18053	21566	24425	9189	282,733	,,
MAFETENG	548	405	2133	17500	18401	15632	8484	8744	20903	12289	9317	7105	121,461	,,
MOHALE'S HOEK	—	121	330	5276	6154	3273	4358	3128	2162	2621	6574	324	34,321	,,
QUTHING	795	—	920	14031	38938	30723	13660	3846	11831	9013	8427	4672	136,856	,,
QACHA'S NEK	4499	869	1886	3606	17186	32797	32131	24340	11982	15953	12039	1218	157,288	,,
MOKHOTLONG	4479	1685	1103	2866	16422	39561	28750	16826	6230	5031	5899	8452	137,304	,,

GRAND TOTAL: 1,180,670 lbs

Woolsheds.

One woolshed in the Ox-Bow area is under construction.

Judging.

The Wool and Mohair Officer assisted with judging at three shows.

Liaison with the Union of South Africa.

Three meetings of the South African Wool Board, one of the South African Mohair Advisory Board and one of the Angora Ram Breeders' Society were attended by the Wool and Mohair Officer during the year.

While on a ram buying tour in September, 1960, the Wool and Mohair Officer and Animal Husbandry Officer visited brokers in Port Elizabeth and East London and the South African Wool and Textile Research Institute in Grahamstown.

5. HIDES AND SKINS.

The firm of H. Hides has made steady, if slow, progress during the year and there has been an increase in the number of Maluti Hides produced. In addition there has been a marked improvement in the sorting and marketing of hides and skins, largely due to the activities of this firm and the co-operation of traders throughout Basutoland. Nevertheless, much remains to be done, and it is essential that the necessity for improved hide preparation be brought home to the primary producer. Provision has been made in the Division's development scheme for the erection of hide bandas at livestock centres throughout the mountains which will, if approved, ensure that facilities for cleaning and preparing hides and skins will be readily available.

Hide and skin improvement to be effective requires the whole-hearted support of Government, traders, Co-operative enterprises and the firms concerned with exports, especially in view of the unfortunate fact that owing to general unrest in Africa, overseas firms are unwilling to risk investment in this sub continent.

6. TATTOOING AND REGISTRATION.

This is still carried out twice yearly in conjunction with the livestock census. It is done by the temporary assistant demonstrators in charge of tank areas, normally assisted by the small stock assistants. The standard of efficiency is very low and census figures are highly suspect. No improvements in this respect can be looked for until such time as a staff, fully qualified to carry out this responsible work, is available.

7. EQUINE IMPROVEMENT.

Equine improvement suffered a very severe setback due to the death of stallion Sir Valiant during the year. Due to shortage of grazing it became necessary in 1959 to move a large part of the stud from Maseru to Quthing. Sir Valiant was moved to Quthing as stud sire but became ill with colic in August 1960 and was in extremis before a veterinary surgeon arrived from Maseru 120 miles away. Sir Valliant was a sire of exceptional promise. A son of Silver Eagle out of an Arab mare, Orange Valley Wilhelmina, he was generally adjudged at least the equal of his sire and his first foals

confirm this view. His loss is a very severe blow and one from which the Agnes Mary Young Memorial Stud will take some time to recover. It has undoubtedly set the course of equine improvement back many years. There is no doubt that his life could have been saved had skilled veterinary attention been readily available, but a combination of official disinterest and poor communications ensured that such was not the case.

This loss indicates the folly of attempting to run an improvement scheme on a shoestring and emphasises the need for an adequate skilled staff if these schemes are to achieve success. This year's crop of foals has been poor in number but not in quality and a full brother of Sir Valiant gives promise of developing into a stud sire. It is hoped that it will be possible to station a veterinary officer at Quthing in the not-too-distant future.

The scheme whereby stallions are to be sold to approved horse breeders bids fair to be successful and to date stallions have been sold at prices ranging from £ to £ . The demand for the sires is increasing and as more and more stallions become available the impact on the breeding of horses in Basutoland should become more evident.

8. CATTLE IMPROVEMENT.

As with stallions, the scheme whereby Brown Swiss bulls are bought by Government from breeders and resold to approved cattle owners at subsidised prices has got under way this year. To date bulls have been imported and the demand for these appears to be on the increase. At the same time the department has undertaken the purchase of cows on behalf of several Basotho. The two chief difficulties so far encountered are: (a) to find sufficient bulls and cows at prices Government and the Basotho can afford to pay, (b) to estimate the requirements of various districts. The first will be overcome as contacts are built up and breeders realise that this is a ready market for their excess (not culled) bulls, and the second by introducing bulls ready for sale into districts where they will be under the eye of, and readily available to, prospective purchasers. Consideration is being given to importing other breeds on behalf of farmers who wish to breed trek oxen or to embark on other improved enterprises but such purchases are not to be subsidised by Government as it is felt that at this stage the triple purpose type of animal is the only one able to meet all requirements of milk, meat and draught power.

SECTION III.

VETERINARY.

1. ANIMAL HEALTH.

116 Blood slides were examined during the year with the following results: equine mange and quarter evil have been reported from all areas. In general there has been an increased demand both for veterinary attention and for prophylactic inoculation which has rather strained the resources of a small veterinary section.

2. SMEAR EXAMINATIONS.

Blood slides were examined during the year with the following results:

Quarter Evil	4
Biliary (Canine)	25
Gallsickness	4
Useless	10
Negative	73

3. SCHEDULED DISEASES.

(1) **Anthrax.**

The position as regards this disease remains favourable and no outbreaks were reported during the year. Some 28,000 doses of anthrax vaccine were used, largely for the preventive inoculation of cattle moving to and from the Union.

(2) **Quarter Evil.**

The incidence of this disease has remained steady and some 65 outbreaks were reported during the year. Distribution was as follows:

Butha Buthe	2
Leribe	4
Berea	6
Maseru	13
Mafeteng	20
Mohale's Hoek	10
Quthing	3
Qacha's Nek	3
Mokhotlong	4
	65

11,250 doses of vaccine were distributed during the year for the control of outbreaks and for the routine inoculation of stock both large and small prior to their removal to the cattle post grazing areas.

(3) **Equine Mange.**

There has been no decrease in the incidence of this disease, nor has it been possible to undertake any campaign to tackle it. The attention of the veterinary section is concentrated on those diseases which, if less common, are of very much greater economic significance and the tackling of equine mange will have to await the creation of a stronger and more effective veterinary section.

(4) **Mange in other Livestock.**

Only a few cases of mange in dogs have been recorded.

(5) **Lumpy Skin Disease.**

This sporadic visitor has not appeared during the year and no preventive inoculation has been carried out. The disease is at present of no real economic significance.

(6) **Rabies.**

Although outbreaks have occurred in many neighbouring areas of the Orange Free State and Northern Cape no outbreaks have yet occurred in Basutoland. The position is being closely watched, but with the present border control very little can actually be done to prevent the illegal movement of dogs to and from the Union. Only two dogs were immunised against rabies during the year.

(7) **Other Scheduled Diseases.**

No other scheduled diseases occurred during the year.

4. NON SCHEDULED DISEASES.

(1) **Anaplasmosis and Piroplasmosis.**

Several cases of redwater and gallsickness have occurred during the year, but few deaths have been reported. The first spray race is under construction on the Maseru Reserve in the vicinity of the Veterinary Clinic, and should be completed and in use early next year. Depending on the use made of it and its efficiency, further races may be erected in the vicinity of ports of exit and entry, as funds become available. During the year some 532 doses of gallsickness vaccine were issued.

(2) **Strangles.**

Most districts experienced more than usually severe outbreaks of strangles, especially in police stables. While no horses were lost as a result, the ensuing lay off of horses which were slow to recover seriously interfered with patrol work.

(3) **Biliary.**

Once more this disease has been very prevalent among dogs and again the severe relapsing form has been encountered. Treatment with trypan blue has continued to prove successful where more modern and more easily applied drugs have failed to knock out infection.

(4) **Verminosis.**

A certain amount of progress in this line can be reported. In spite of staff difficulties the percentage of sheep dosed each month has gradually increased to 75 per cent., which is the highest figure yet achieved. Reports indicate that the dosing is having effect and that few small stock are dying as a direct result of worm infestation. Nevertheless the position is by no means satisfactory and there will have to be a further marked increase in dosing efficiency before any real improvement in wool and mohair production can be expected.

(5) **Seneciosis.**

Many horses are lost each year as a result of senecio poisoning which is especially prevalent in the mountain areas in spring.

(6) **Horsesickness.**

Again very few cases were reported but there has been an increased demand for vaccine. In all 1956 doses of horsesickness vaccine were issued.

(7) **Bluetongue.**

Several cases were reported but losses were not heavy. 10,660 doses of bluetongue vaccine were supplied.

(8) **Enterotoxaemia.**

No cases were reported. 850 Doses of vaccine were issued during the year.

(9) **Distemper.**

Several cases have been encountered, mainly in Maseru. The disease has hitherto not been severe and all cases have recovered. 38 Dogs were immunised against this disease.

(10) **Feline Enteritis.**

Few cases have been reported. Two cats have been immunised.

(11) **Ringworm.**

Has been rife in Maseru and has affected dogs, cats and humans, several obstinate cases having been encountered. The absence of an isolation kennel or box for these animals has rendered treatment doubly difficult.

(12) **Infectious Infertility.**

No cases have been diagnosed. 33 Doses of strain 19 vaccine have been used.

(13) **Poultry Diseases.**

Fowl Typhoid, Fowl Pox, Coccidiosis and Chronic Respiratory Disease are rife throughout the Territory. This is largely due to the poor conditions under which birds are maintained and also to the social habit of taking a fowl along as a gift to a friend. All birds are thus continually exposed to infection and susceptible birds issued to farmers for breed improvement have a very low survival rate.

The following vaccines were issued during the year:—

Fowl Typhoid	4,950 doses.
Fowl Pox	3,550 doses.

5. VETERINARY CLINIC.

The year has been a busy one; a considerable number of animals have been attended to and much progress has been made in improving the facilities of the Veterinary Clinic.

The number of medical cases treated was	3,346.
Surgical cases	80.
Castration of Stallions	85.
Castration of Bulls	205.

In addition all cattle imported or exported were vaccinated against anthrax and all imported animals were inspected at the Maseru Bridge.

Clinics were run at Morija and Roma and a considerable number of visits made to outlying areas to attend sick stock or to carry out preventative vaccination. The Clinic attended to all Government owned animals in Maseru and the staff carried out routine inspections and treated sick animals.

Considerable progress has been made in improving the facilities of the Veterinary Clinic, including the division of the existing camps into smaller paddocks and the provision of piped water to the camps. Post and rail handling paddocks and a new crush pen have been erected, while a large storage shed and stable have been completed. Electricity supplies have been extended to the Clinic, the stud stables and staff quarters.

The grounds have been improved and tree planting undertaken. A cattle spray race has been erected and will be in operation fairly soon.

New instruments and equipment have been purchased for the Clinic and the field veterinary staff.

Six new veterinary assistants are at present undergoing training at the Clinic.

Revenue for the year in respect of clinical works amounted to:

Clinic	£818.0.0
Districts ..	£820.0.0
Total	£1,638.0.0

SECTION IV

SOIL CONSERVATION

General

It is with regret that this year's report has to reflect what must be considered the most unsatisfactory and disappointing results in the history of soil conservation in Basutoland. This state of affairs is largely due to the delay in the approval of funds for the continuation of operations as from April of 1960. As was stated in the previous report the mechanical equipment is very old and no longer able to continue with efficient service. The necessary replacements have not been forthcoming and as a result production has dropped to a very low level. This has also affected staff requirements and therefore, indirectly, the use of recurrent funds as our field units have not been up to strength. Fortunately, however, weather conditions have been favourable and tree planting and grass establishment through direct planting as well as natural processes has had ample opportunity to benefit.

Buffer Stripping

This operation is no longer a major item as it has been completed. However, the maintenance of these structures is very disappointing and when touring the country one cannot help but see the extent to which the strips are being reduced in effectiveness by narrowing down and/or complete destruction. If this condition is allowed to proceed it will not be long before these buffer strips become completely ineffective.

Terraces

On account of the poor state of the mechanical equipment the units have been removed from their normal operational areas and concentrated in the Maseru district. This was considered necessary as it would reduce travel distance by supervisory and maintenance staff and afford the opportunity of overhauling what units may be considered suitable for further service in the new scheme. Terracing has therefore been discontinued until such time as the units return to their respective areas.

In Taung, however, terracing of lands in the Mokoroane's sub-ward continued on a reduced scale.

It must be pointed out that damage to old works is extensive and maintenance entirely non-existent. This is a very serious state of affairs as much erosion is being caused as a result.

Meadow Stripping and Donga Beaconing

These operations for the time being have been discontinued as far as large scale operations are concerned.

In some districts, however, attempts are being made by field staff to re-establish meadow strips previously laid out but destroyed by ploughing.

Dam Construction

As all units, with the exception of those operating in Taung, have been brought in to Maseru this operation has been considerably reduced. The only dams built this year are in the Thaba Bosiu area of Maseru and Taung in Mohale's Hoek. Work on the Kolo-la-Pere weir continues and sand has now been collected to a depth of six feet. So far indications are favourable and it is anticipated that this system of water storage in sand should prove successful and very useful. It is difficult to assess draw off and recharge rates

at this stage but once the sand depth reaches 9—10ft. more stable conditions should develop to allow these measurements to be taken.

PRODUCTION TABLE FOR 1960

	Prior to 1960	During 1960	Total to December 1960
Area Terraced (acres)	493,233	2,804	496,037
Length of Terrace (miles)	26,714	114	26,828
Buffer Strips (acres)	688,018	26	688,044
Diversion Furrows (miles)	3,951	—	3,951
Dams Constructed	617	22	639
Concrete Weirs and Inlets	17	—	17
Trees Planted	2,512,875	163,105	2,675,980
Dongas Beaconed (miles)	5,443	38	5,481
Meadow Strips (miles)	1,405	—	1,405
Reclamation Beaconing (acres)	13,296	—	13,296

Land Use Planning

During the year much of the time of the soil conservation section has been devoted to land use planning. This is to be expected as the biological control of erosion continues to play an increasingly important part in the work and outlook of the section. Coupled with the biological control are the ever present sociological problems and both these aspects have to be considered side by side, in most cases being treated as one complex problem, the satisfactory solution of which provides the starting point for better farming activities.

(a) **Taung Rehabilitation Scheme**

The hoped-for acceleration of progress in Taung this year has not materialised. On the contrary conditions in the ward have deteriorated very markedly and progress of operations has been most adversely affected. This most unfortunate state of affairs is almost entirely due to political disturbance and the resultant rivalry between the various factions.

The recently formed District Council has taken over the administration of the scheme and a new planning committee has been formed. This committee is very active in the committee stage but is at present unable to implement its resolutions in the field.

In the past all small stock have been removed from Taung to cattle-post areas in the mountains during the summer and all mountain slopes in Taung closed to grazing during this period. This practice had brought about very good recovery of the veld in Taung and it looked as if the ward was well on its way to achieving the recovery of its grazing.

This summer, however, stock owners and some of the chiefs have refused to remove their small stock and no longer observe the grazing control regulations. This means that much good work is now being rapidly undone and the veld is being reduced to its previous poor condition.

Reclamation areas, the only effective means of attempting to control erosion, are again being ploughed indiscriminately and the erosion which was taking place in these areas and had, during their closure, been arrested is once more proceeding apace.

The second stage—development—has been started in the Linareng sub-ward and a more detailed analysis of ground conditions has been made. This analysis aims at the division of the agricultural soil into production potential classes with a view to the re-establishment of the people on these lands in

more economic and stable arable units. However, much more research, discussion and public relations work still lie ahead before any form of implementation along these lines can be anticipated.

Mechanical works associated with the development stage are proceeding. These operations include the building of water storage dams and weirs for domestic, stock and irrigation purposes as well as the laying out and construction of circuit roads for inter-village communication as well as access to lands. Prospective village sites have been selected and these are being planned in detail for village layout and provision of such amenities as water, vegetable gardens, orchards, etc.

Tractor units in the Mokeroane's sub-ward continue with basic anti-erosion measures but under very difficult conditions indeed. Much opposition to certain reclamation operations is being experienced and works in some cases are being opposed and physically destroyed.

(b) **Makhoakhoeng Ward and Ox Bow** (Butha Buthe)

The initial land analysis survey of this area covering nearly 200 square miles has been completed and the maps are being compiled in order that field operations can come into effect before the summer of 1961-62. As this ward includes the Ox Bow Lake catchment, further operations in Ox Bow will in future be part and parcel of the Makhoakhoeng scheme. This is similar to the Taung scheme, but is of special significance as the area incorporates the headwater catchments of the Caledon River and the whole of the catchment of the proposed Ox Bow Lake dam. Field operations will commence as soon as funds become available. In the meanwhile the results of the survey will be compiled and presented to the planning committee, which has already been formed by its parent body, the District Council.

(c) **Mejametalana Scheme**

This is a fifteen square mile catchment on the outskirts of Maseru which is to be planned for water development and intensive agricultural and horticultural production to meet the requirements of the Maseru market. The land analysis survey is complete and a plan of action for the initial stage of operations has been drawn up and presented to the planning committee.

Approval has already been obtained and operations have commenced on the building of one or two dams. Major structures will include the building of eighteen dams in the catchment area. These dams will be used for flood control, silt trapping, watch storage and diversion for possible irrigation.

It is also intended to finally divert water to the Experimental Farm for applied irrigation and irrigation research in accordance with the recommendations of the Economic Commission.

Eighteen new fenced tree plantations will also be established which will produce over 500,000 trees.

Vegetable production, fruit growing and more intensive agricultural crop production will be developed in accordance with local ecological conditions, at the same time bearing in mind the proximity of good marketing possibilities in Maseru.

(d) **Tebetebeng Catchment**

Operations have been stopped until funds and equipment once more become available.

(e) **Caledon River Scheme**

This is not actually part of the current Colonial Development and Welfare Soil Conservation Scheme. Estimates have been submitted separately.

Approval of these funds is still awaited. In the meantime a tentative start has been made in the Teyateyaneng district. This was considered worthwhile because funds were available from the present scheme on account of curtailment of operations in other spheres of capital construction works. It also gives a valuable opportunity to investigate problems and methods associated with the execution of tree planting operations on a large scale.

Although great pains were taken to try to get the District Council, chiefs and people to understand and appreciate the full significance of this work there has been considerable opposition from small numbers of local people roused by political parties. It is expected that this initial opposition will die down and that with a carefully planned approach people will begin to appreciate the benefits to be derived from the scheme.

The scheme covers the whole of the Caledon River from its source to the point where it leaves Basutoland near Wepener in the Orange Free State, a total of 227 miles. The Teyateyaneng section covers 26 miles of river and to date 120,500 trees have been planted at a cost of £936. This figure includes fencing, beaconing and planting.

(f) **Grazing Control**

(i) **Dip Tank Survey**

Work is still proceeding on the survey and will be completed this summer. After completion a detailed report will be prepared.

(ii) **Grass Community Survey**

A team of botanists from Rhodes University visited the Ox Bow Catchment during January and started analytical investigations into the composition of the veld in this area. The survey is being repeated this summer by the same team. It is anticipated that this analysis will be continued on a yearly basis and will in due course produce valuable information in regard to the composition and changes of our veld from year to year.

(iii) **Veld Use**

A draft memorandum has been drawn up on this subject and when finally approved will be submitted as a terrirtorial guide to the utilisation and conservation of our veld in Basutoland.

An attempt has also been made by means of an agro-ecological map of Basutoland to indicate the important role that the veld plays, or should play, in the economic development of the country. The map is also in the draft stage at the moment.

Conclusion

As was stated earlier in this report, progress in general has not been satisfactory and much time has been wasted from the point of view of engineering operations in the field. As these operations largely include basic anti-erosion measures, the completion of this phase of the work is further delayed. By the time operations start again over a year's production will have been lost.

The constitutional changes in Basutoland have resulted in some interesting reactions on the part of the various political parties and government bodies which without a doubt have influenced programme implementation throughout the territory. Some of these influences have been upsetting while some have been most encouraging. It is earnestly hoped that these teething troubles will be sorted out and the powers that be will settle down to a more rational approach and appreciate the very serious state of affairs the natural resources

of Basutoland are in and how vitally dependent the nation is on the adequate conservation of these natural resources.

It is strongly felt from experience that a sense of responsibility is lacking among the people of Basutoland. They fail to realise that they must play their part in the conservation of the land. If they do not co-operate success can never be achieved and all that has been done in the past will be lost.

We are reaching the stage in our conservation programme where the bulldozer is no longer the kingpin of the operation. We are now facing up more to the human problem rather than the mechanical. Once we appreciate that erosion is biological as well as physical we are on the right lines towards understanding the full concept of conservation.

FORESTRY

General

(a) With the coming of the new political set-up in some districts difficulties arose and these had an adverse effect on the progress of tree planting. (These difficulties are to be expected in any new poiltical set-up in all countries of the world.) It is hoped that these difficulties will soon be ironed out and that the work will again go ahead unhampered.

(b) The old curse of the shortage of funds remains with us and still retards progress. (It does not appear that this foe can be laid by the heel in the foreseeable future.) The improvement shown in the yearly plantings has been, in spite of these two above, and can only be ascribed to the improved running of the machinery of planting.

Nurseries

Once more the number of field nurseries was increased, which accounts for the increase in the number of cuttings planted this year.

Lectures

As the general public and chiefs now realise the importance of tree planting, the need for lectures is not so great and comparatively few lectures were consequently given. The only difficulty (in this respect) is the unavoidable reluctance of the people to hand over portions of their lands for tree planting. There is a shortage of arable land in the country.

Fruit Trees

This year importation of fruit trees from the Orange Free State was started in June and some 21,000 trees were sold to the people at only 1/- a tree, thanks to the favourable price charged by De Leew's Nurseries, Clarens, Orange Free State. This number could have been much larger but for the lack of time in bringing trees over. They are in great demand. A scheme to start our own nurseries of fruit trees is under consideration.

A tour of all the districts to interest District Councils in tree plantations was, inter alia, undertaken and as a result District Councils are anxious to carry on this work. In two districts difficulties occasioned by different interpretations of certain clauses of the new constitution hampered the work. The difficulties were to be expected as change is usually accompanied by difficulties.

The following is a list of trees planted during the year 1960 compared with the year 1959.

	CONIFEROUS		POPLARS		WILLOWS		FRUIT TREES		TOTALS	
	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960
BUTHA BUTHE	2,158	1,240	70,866	111,561	1,260	7,000	1,001	3,000	75,285	116,501
LERIBE	4,237	2,180	106,329	141,736	4,100	1,100	2,556	3,000	117,222	148,016
TEYATEYANENG	1,618	1,810	53,164	173,878	756	800	1,556	3,000	57,940	179,488
MASERU	6,474	2,250	212,658	262,482	2,100	950	1,556	3,000	222,788	268,682
MAFETENG	5,395	3,070	177,251	221,826	3,726	840	656	3,000	187,028	228,736
MOHALE'S HOEK	4,316	2,280	141,772	192,804	6,170	1,010	—	3,000	152,258	199,094
QUTHING	1,539	1,980	17,742	93,015	—	990	—	3,000	19,281	98,985
QACHA'S NEK	4,500	200	53,164	2,709	204	98	—	—	57,868	3,007
MOKHOTLONG	670	99	17,700	300	—	20	—	—	18,370	419
TOTALS	30,909	15,109	580,646	1,200,311	18,316	60,508	7,325	21,000	907,194	1,242,928

YEAR	GRAND TOTALS
1959	907,194
1960	1 242,928

SEEDLINGS AND CUTTINGS IN NURSERIES

	CONIFEROUS 1960	POPLARS 1960	WILLOWS 1960	TOTALS 1960
BUTHA BUTHE	361	103,501	2,730	106,592
LERIBE	722	145,438	—	146,160
TEYATEYANENG	370	139,756	1,550	141,676
MASERU	1,324	265,605	400	267,329
MAFETENG	365	228,844	—	229,209
MOHALE'S HOEK	722	201,376	—	202,098
QUTHING	363	8,000	850	9,213
QACHA'S NEK	—	96,085	420	96,505
	4,227	1,188,605	5,950	1,198,782

GRAND TOTAL: 1,198,782

Note: Compared with the season 1959-1960 the 1960 nurseries production is slightly lower. The reason for this is the higher death rate due to late heavy frosts Much heavier plantings had been made.

SECTION VI

STATISTICS

Policy

The policy of the Statistics Section of the Agricultural Department is to try and put figures together and interpret them in the form of a general economic picture, and secondly to assist Government in the formulation of its agricultural policy.

Financial Matters

In 1959 great difficulties were experienced in carrying out this policy, mainly due to lack of funds. During the year under review much has been achieved through the approval for expenditure of the sum of £1,750 against advances pending the submission of a Colonial Development and Welfare application for Statistical Services in the Territory. This money was spent largely on the employment of school teachers to conduct the preliminary Agricultural Census at the beginning of the year, and in purchasing equipment required for the detailed census which began towards the end of the year.

The Future

It is anticipated that when the scheme is approved and funds are available it will be possible to expand the present services to cope with all departmental requirements and to undertake work on behalf of other departments.

Work Done

With the available funds and also through the assistance given by the Director of Livestock and Agricultural Services, it was possible to carry out the following operations during the year:—

(a) **Biometry**

The section continues to play a useful part in advising the Maseru Experiment Station on the design and analysis of field experiments. This year yield data for 53 field trials conducted by the station were analysed. Although it would have been desirable to complete the statistical analyses of these experiments before the next planting season, shortage of full time computers and also the fact that the two assistants available were engaged full time on census work, made it impossible to finish this work in time.

To attain statistical efficiency at minimum costs would require a great deal of research work into the experimental techniques and layouts employed under local field conditions. This research work can only be carried out when suitable facilities are provided.

With the present staff, of the data collected by the Station, only grain yield figures are analysed, while the bulk of the auxiliary information recorded in the field remains untouched.

(b) **Consultation**

During the year assistance was given to members of the World Health Organisation Nutrition Survey Team in the analyses and interpretation of their figures and to various sectional officers confronted with problems of collecting, analysing and interpreting data.

(c) **Lectures**

Unlike the previous year, very few lectures were given. Those which were given consisted of statistics connected with work on community development organised by the Extension Service Department of Pius XII University College. Various lectures were also given to enumerators carrying out work for the 1960 Agricultural Census.

(d) **Agricultural Census**

Great importance was attached to the work which is presently being carried out in the Territory as Basutoland's contribution to the 1960 World Agricultural Census, sponsored by the Food and Agriculture Organisation of the United Nations. Working on a census programme prepared from the Pilot Survey conducted in 1959, it was possible to carry out work described under the following headings:—

(i) **Village Lists.** A list of village population for the 202 dip tank areas into which the country is divided was prepared and published. Although the lists were meant to serve as a first stage frame for the agricultural census, their distribution among various Government officials, chiefs and local government bodies has enhanced their use not only as administrative tools but also as organs for community development and extension work programmes in the Territory. These lists are being revised in order to obtain a complete and up-to-date version of the rural settlements and their distribution by village groups.

(ii) **Preliminary Census.** In February this year a preliminary survey of 317 enumerators' areas was carried out. In this survey school teachers who were kindly made available by the Education Department were engaged as enumerators. This enquiry, which lasted a month, was conducted solely for the purpose of constructing a frame of farming households required for the second stage of the census enumeration. By the end of March all forms were received, checked and used to draw out a sample for the detailed census described below. The result of this preliminary census will form a chapter of the report on the census methodology to be completed towards the end of 1961.

(iii) **The Main Census.** Much work on the collection of actual agricultural information required for the 1960 census was carried out during the year. This work is best described under the following sub headings:—

(a) The sample: Owing to the shortage of the field staff out of a sample of the original 317 enumerators' areas covered in the preliminary census, 242 areas were selected at random for the detailed survey. In each of these areas a sample of 10 farming households was investigated, making a total of 2,420 households for the entire survey, — i.e. about 1½% sample of the population of Basutoland.

(b) Enumerators: The preliminary interviewing and questioning of the entire field staff of the Agricultural Department resulted in the selection of 110 demonstrators found to be suitably qualified to carry out the survey. Each enumerator was scheduled to work on 20—30 families in his area for the main census.

(c) 1st Phase: The first phase of the census was completed in August when detailed enumeration of all population units, livestock, implements, dwellings and storage facilities belonging to the selected households was carried out. This month was considered ideal for the enumeration. Data received were edited, checked and filed, ready for processing.

(d) 2nd Phase: The second phase, launched in October, was meant to cover all winter crops such as wheat, peas, barley and oats—all of which would be ready for harvest towards the end of the year. This enumeration consisted of measuring all lands planted to these

crops and of taking sub samples of yield from two 1/40th-acre plots for each crop planted by the household. Land classification studies were also carried out to assess, amongst other things, the degree of erosion, slope, aspect, soil type and the opening up of virgin land in the grazing areas of Basutoland.

The third and final phase of the census, which is meant to cover all summer crops, will begin in February, 1961 and is expected to be completed by July.

(c) Training: All census work done during the year was preceded by an intensive training campaign intended to familiarise enumerators with the field work. The training consisted of lectures on the census procedure and the filling in of forms, with practical lessons on measuring lands and weighing produce. Enumerators were also briefed on the use of census equipment provided for them. The total training period for the enumerators was staggered throughout the year and each enumerator received a total of not less than 30 days of training, most of which were devoted to the field work. Constant supervision was maintained throughout the year by either visiting enumerators in their own areas or by contacting them monthly on pay-days at district headquarters.

The census is still in progress, much of the work is already accomplished and forms are being checked at the centre as they come in.

(e) Cattle Post Survey

Parallel to the work now being carried out in the village areas, plans for a pilot study of the mountain grazing areas of Basutoland are well under way. The aim of this investigation is to obtain such socio-agro-economic information on the cattle post as an institution as will enable the department to formulate suitable grazing control policies for the mountain areas, taking the traditional herding habits of the people into consideration. The importance of such an enquiry is emphasised by the fact that the haphazard herding of flocks and the poor management of the mountain slopes of Basutoland are the chief causes of their erosion, which in turn dry up rivers and make the control of run-off in the lowlands difficult On the economic side, irrational policies based on guess estimates can cripple a livestock industry which at present contributes more than 60% of the total export trade.

(f) Descriptive Statistics.

Routine data obtained from administrative sources continue to be collected and assembled in the form of statistical series. Great interest has already been shown in meteorology figures presently being published and in crop data condensed from traders' returns. The report which will be published separately is continuously being revised to cater for new demands in the field of agricultural statistics.

Staff Matters

During the year no additional staff was engaged to make up for the additional work undertaken. Most of the work described above could never have been achieved were it not for the valuable assistance rendered by Messrs C. M. Mokete, B.Sc. and E. B. Mosoang. Mrs G. Ts'olo undertook the typing of the census schedules, while Mr Manare, a Pius XII University College student, engaged during the summer vacation, handled most of the statistical analysis of field experimental figures.

PART III.

A REVIEW OF AGRICULTURAL RESEARCH IN BASUTOLAND 1952-60.

BY A. C. MACINTOSH,
AGRICULTURAL RESEARCH OFFICER.

(1) INTRODUCTION.

(a) **The Territory:** Basutoland is a mountainous enclave of approximately 11,700 square miles entirely surrounded by the Union of South Africa. To the East, the high escarpment of the Drakensberg mountains forms a natural barrier between Basutoland and the Coastal Shelf, where the Union provinces of Natal and the Cape meet. To the West the mountains give way to a lowland strip varying in width from 10 to 30 miles whose boundary with the Orange Free State is marked by the Caledon River for most of its length.

The territory is roughly rectangular in shape, measuring about 130 miles from Nort East to South West and about 90 miles across. Four-fifths of Basutoland are steeply mountainous and almost without roads, although bridle paths and tracks, negotiable only by mules and horses abound. The remaining one-fifth of the territory consists of a lowland area, 5-6,000 feet above sea-level, and is a part of the Caledon River Catchment.

The 1956 census gave a population of 642,000 inhabitants resident in Basutoland. It is estimated that the population is now nearer 750,000, of which approximately 2,000 are of European origin. Approximately two-thirds of the population live in the lowland strip, resulting in a very high population density and exerting severe pressure on the available land, which, because of the ravages of soil erosion, is rapidly becoming less and less.

(b) **The Climate:** In the lowlands there is a rainfall gradient ranging from approximately 35 inches in the north to 25 inches in the south; while in the Mountains the rainfall varies from 80 inches to as low as 15 inches in certain rain-shadow areas. About 90 per cent. of the rain falls in Spring, Summer and Autumn (September to May) while occasional winter rains in the lowlands, result in snowfalls of varying intensity in the mountains.

The Summers are temperate with maximum day temperatures rarely exceeding 92 degrees and the minimum varying between 40 and 65 degrees F. The winters are cold, frosts being frequent and in mid-winter, regular occurrences, night temperatures often drop to 5 degrees F. or less while the day temperatures vary from 40 degrees to 65 degrees F. Frost has been known to occur in every district of Basutoland in each month of the year. The frost hazard is perforce a major one in Basutoland agriculture.

The relative humidity in winter averages about 30 per cent. while in summer is between 40 per cent. and 60 per cent.

The rainfall is mostly from thunderstorms with a high intensity resulting in rapid run-off and poor penetration. This is particularly marked when overgrazing and bad land usage have removed most of the surface cover.

The rainfall is variable and unreliable and prolonged summer droughts occur with monotonous regularity.

(c) **The Geology:**

The rocks of Basutoland all belong to the upper Karroo system which came before the tertiary and cretaceous systems, and correspond to the Carboniferous, Permian, Triassic and Jurassic systems of Europe, putting them in the upper Paleozoic and lower Mesozoic eras with an age of between 100,000,000 to 300,000,000 years.

Of the 4 series making up the Karroo system viz. Stormberg, Beaufort, Ecca and Dwyka only rocks of the former two occur in Basutoland.

The lowest rocks visible in Basutoland belong to the upper Beaufort series consisting of sandstones and shales; and occur only in the Southern lowlands. On top of the upper Beauforts is the Stormberg series consisting of the Molteno Beds, Red Beds, Cave Sandstone and Drakensberg Basalts in ascending order.

The Molteno beds consist of grey and blue coloured shales and very coarse sandstones with thin layers of coal here and there. The Red Beds consist of red coloured sandstones, mudstones and shales and are dominant in the lowlands.

The Cave Sandstones consist entirely of fine grained sandstones of aeolian origin of great depth, the tops of which are at an elevation of approximately 6,000 feet above sea level.

The Drakensberg Basalts lie on top of the Cave Sandstone. They were poured out in succeeding lava flows of varying thickness, attaining a final thickness of over 4,000 feet. These Basalts are almost entirely Amygdaloidal and form the main mountain massif of the territory. During the period when the Basalts were laid down there were frequent earth disturbances and numerous doleritic dykes and sills were intruded into the underlying sedimentary rocks of the Karroo system.

The above conformations have with the passage of time and agencies of erosion given Basutoland a distinctive terrain.

The lowlands consist of flat to undulating plains of varying sizes interspersed with flat-topped outliers and islands rising 600 to 1,000 feet above them and capped by cave sandstone, and doleritic hills and ridges of varying heights.

The mountain area, consisting almost entirely of Basalts is precipitous with deep valleys and little flat ground. On the western slopes of the first mountain range and sloping to the top of the Cave Sandstones is the foothill area which in the main, is steeply undulating with some deep incisive valleys.

(d) **The Soils:**

The pattern of the soils in Basutoland is comparatively simple and can be divided into a relatively small number of clearly defined types. They are in the Mountains and Foothills:—

(1) **Mountain Black Clay:** A Residual soil formed from amygdaloidal basalt. The topsoil consists of 10 to 15 inches of black clay merging into a variable gravelly stony clay, lying on rotten parent material. Frequently the topsoil merges into the parent material. The organic matter content and base status of the topsoil are high. Structure is good and drainage free. pH increases with depth from 6.8 at surface to 7.2 in the gravel.

(2) **Foothill Red loam:** Formed from Basalt on a warm aspect. The topsoil consists of 10 to 15 inches of reddish brown clay loam with a well developed crumb structure. pH 5.3 to 5.5. A discontinuous thin stone line with numerous concretions, cemented to incipient murram in places.

A farmer tries out a home-made sprayer during the stalk borer campaign.

The principal agricultural officer discussing a cropping programme in the communal garden at Teyateyaneng.

The soil conservation officer completing a survey of grazing in the Butha-Buthe district.

Progressive farmers proudly display their certificates at Butha-Buthe.

Two farmers take delivery of stud Angora rams after attending a Progressive Farmers' Course at the Agricultural School.

A fine crop of white haricot beans at Leribe Training Farm.

A progressive farmer's son applying kraal manure to his lands.

The vegetable garden at Maseru Training Farm.

An attentive audience at a demonstration during the stalk borer campaign. The Public Relations van is seen on the left.

Students at Maseru Training Farm loading cow pea hay — a trial crop.

divides the topsoil from the subsoil. The latter consists of red gravelly clay merging into spheroidally weathered basalt. Drainage is free.

(3) **Foothill Black Clay** occurs on the flatter poorly drained slopes in the foothills. Parent material is basalt with no clear horizons. Depth is variable and drainage poor. It is a heavy black clay.

In the lowlands intrusions of dolerite are frequent and the weathering products of this dolerite have markedly influenced the soil formation processes, their characteristic effect being a reduction in illuviation and the development of orange and reddish brown colours. The main soils occurring in the lowlands are:—

(1) **Grey brown sandy loam (Solonetzic).** 10 to 18 inches of grey-brown sandy loam, pH 5.4, overlying 36in. or more of yellowish brown mottled gravelly clay. The topsoil is low in organic matter and has weak crumb structure. Iron concretions abound at the bottom of this horizon. The clay substratum (pH 6.8 to 7.3) has marked columnar structure, the tops of the columns being rounded and overlain by a thin layer of quartz. Lime concretions are also found here. Root penetration into the subsoil is confined to places between columns, and drainage is poor. Periodic water-logging and the lateral movement of water on top of the clay, leading to surface oozes, commonly occur.

(2) **Red Sandy loam** 24in. structureless light reddish brown fine sandy loam; pH 5.5, merging into 24in. or more of uniform orange red sandy loam. These soils occur on or near dolerite instrusions and the parent material may be sandstone or dolerite. Drainage is free and depth is usually good.

(3) **Light brown sandy loam** consists of 9in. light brown structureless fine sandy loam, pH 5.4 on 12 inch yellowish brown fine sandy loam with numerous small iron concretions, uncemented in a matrix of yellow loam, lying on 8in. of orange sandy clay loam with a few mottles. Parent material is whitish weathered sandstone. Drainage is moderate.

(4) **Plateau sandy loams** occur on top of cave standstone plateaux where basaltic capping has not occurred. They are light reddish brown, very sandy and very acid (pH 4.0 to 5.0.) The subsoil is heavy mottled grey-brown clay.

(e) **Land Tenure.**

All land in Basutoland is held in trust for the nation by the Paramount Chief. Allocations of land are given to the people by the Paramount Chief through his subsidiary chiefs. There is no title to land, and once a man marries he is entitled to a land allocation. The average size of a land holding is 5.75 acres of arable but there are great variations to this figure. The average holding usually consists of 3 to 4 small pieces of land of different soil types, traditionally apart from each other to minimise hail damage and to allow each cultivator to have good and poor land. The systems lends itself to the presence of many small blocks of cultivated land.

(d) **The Farming Community:** By tradition all Basotho are farmers. Wealth is measured by stock numbers and not quality. The standard of agriculture is low, even by peasant standards, and the lack of title mitigates against the will to develop holdings to the degree that occurs elsewhere.

(2) RESEARCH ORGANISATION.

Until January, 1952, when a Soil Fertility Worker was appointed to Basutoland, all Agricultural Research had been on a very limited scale. Because of the lack of proper facilities and the absence of scientifically trained workers this initial investigational work cannot be termed true research and was more of the order of demonstrations and trials from which very few facts emerged.

(a) Establishment of An Experiment Station and District Sub-Stations.

The story behind the establishment of Maseru Experiment Station is best described by the following quotation from the Departmental Report For 1951:

"In the report of the previous year it was stated that, for convenience, the Agricultural and Livestock Officer in charge of experimental work was to conduct experiments on the farm attached to the Leper Settlement. As certain objections were raised by the Native authority to the use of the farm for any purpose other than the production of fresh food for the inmates of the Institution, experimental plot work had to be abandoned for the time being. In view of the fact that a Soil Fertility Worker was expected to join the staff during the year, it was considered desirable that all experimental work and the question of a site for experimental plots at an Experiment Station should await his arrival in the Territory."

"In this connection reference must be made to the visits of the Paramount Chief and a party of advisers to Britain during the year, and to a Pilot Project which has been planned. The Paramount Chief spent the months of October and November in England, Scotland and Wales, visiting various places of agricultural interest. On their return the party urged on Government the need for a proper Experiment Station, and an advisory service of specialists, to deal experimentally with all agricultural matters, including crop, soil and livestock problems. Estimates of the cost of providing these services have been prepared, and it is considered that the establishment of a fact finding section within the Department will provide information without which an increased tempo of progress will be difficult."

In January, 1952, Mr A. C. Venn (now Senior Scientific Officer, Swaziland) arrived as Soil Fertility Officer to the Territory. His first duties were a study of the geography, soils and agriculture of the territory and a review of the experimental work in progress at the Leper Settlement farm.

"Because many lands had in the past been varyingly manured for grain production, and for administrative reasons, the Leper Settlement farm was found unsuitable for development as an Experiment Station."

At the request of the Paramount Chief, the proposals for the large scale Pilot Project Scheme were modified at this stage to include an Experiment Station. After consultations it was decided:—

"(a) that a suitable piece of land near Maseru should be sought as an Experiment Station, to be equipped eventually with laboratory facilities, and

"(b) that on the various soil and ecological zones of the territory should be established a series of small sub-stations. The two would be worked in conjunction in a survey of the fertility status and fertiliser requirements of the various soils, and for investigations into varieties of existing crops, new crops, methods of arable land management, pasture management, etc."

It was in June, 1952, that the Paramount Chief's representative finally

handed over the plots of land for twelve district sub-stations to the Department of Agriculture.

The selection of the plots was based on the following criteria:—

(a) They should be representative in terms of the main soil and climate zones and so arranged to give good coverage of the Territory.

(b) Typical impoverished soil that had not, within memory, received any manurial dressing was necessary.

(c) Steep land dissected by contour terraces and plough banks was unsuitable.

(d) The land should be near a village spring.

(e) Where possible Government Reserve land should be used.

(f) Where no suitable Reserve land was available, that worked by indifferent agriculturalists should preferentially be selected.

Except in one centre, no opposition was encountered from the people in the handing over their much valued land for investigational purposes.

By the end of 1952 eleven district sub-stations had been fenced, equipped with tools and implements; and a caretaker-cum-labourer housed and installed.

"In May 1952, the Soil Fertility Officer conducted a Survey of the Maseru Government Reserve to select a suitable site for development as an Experiment Station. Such an area, some 600 acres in extent, was found on the edge of the town, bordering on the Caledon River. The topography is open rolling; the vegetation virgin climax grassland, advanced successionary grass stages on old fallows and new fallows under primary invading grasses and weeds. The soils are representative of those in the lowlands (grey sandy loams, red sandy loams and alluvial brown loams). Some 200 acres of land were under crops in 1951, of which it was found that approximately 100 acres could be irrigated. . .

"Plans to take over this area of Government land for a station were drawn up in consultation with the Paramount Chief. At her request the matter was referred to the Basutoland Council and in its annual session in September an overwhelming majority of councillors voted in favour of the project."

It was decided that the district experiment plots would house a basic set of exploratory experiments on Major and Minor elements, together with certain other projects, while on the main station would be centred the larger agronomy experiments of more complicated design.

The first experiment at Maseru Experiment Station — a maize variety trial was planted in November 1952, but was later abandoned because of insect damage and trespassing stock. After this the first 22 of the basic set of N.P.K. trials on Maize, Sorghum and Wheat were planted on the district sub-stations.

(b) **Finance:**

From the inception of Maseru Experiment Station in 1952 until 1958 the Research work has been financed from C.D. & W. funds with contributions from local Government Funds. For the year 1959 and 1960 the cost of Agricultural Research in Basutoland has been borne by the Territory.

The generous C.D. & W. contribution has enabled the department to develop an Experiment Station which is well equipped with implements and the necessary buildings. Development has continued throughout the period the station has been functional and it is intended that progress will continue.

(c) **Development of the Experiment Station.**

Once the Central Station for fertility studies had been established it was found politic to widen the scope of activities there. A pig and poultry section was started in 1953 which started production of pigs and poultry for resale to Basotho farmers in 1954. During the same year a forestry nursery section was established at the station.

In 1954 C.D. & W. funds were allocated to establish the Maseru Agricultural School at the Station. The School opened in March 1955.

The functions of the Maseru Experiment Station were then threefold:—

(1) Research in Soil and Crop problems.

(2) Agricultural and Conservation Education.

(3) Production and/or distribution of various agricultural products, and these activities are still current practice.

From 1957-1959, the station was the headquarters of the Department's Agricultural Trading Account which purchased agricultural commodities such as seeds, fertilizers, insecticides, etc., repacked these into convenient packings, and sold them at near cost to farmers. Owing to the phenomenal growth of this Trading Account which become too big to be handled departmentally, it was taken over by the Registrar of Co-operative Societies in January, 1960.

(d) **Staffing.**

The Research Officer is in charge of the station as a whole, and also carries out the research programme as decided upon by a committee consisting of the Director, Principal Agricultural Officer, Research Officer and Soil Conservation Officer. The Agricultural School is controlled by the Agricultural Education Officer while the farm activities fall under the Farm Manager.

All matters of station policy and planning are vested in the Maseru Experiment Station Management Committee consisting of Principal Veterinary Officer, Principal Agricultural Officer, Soil Conservation Officer and Research Officer with other departmental officers being co-opted when required for specific purposes.

In carrying out the Research programme the Research Officer is assisted by the Experimental Assistant and 3 experimental recorders all of whom are of Diploma in Agriculture standard.

The casual labour force varies in size according to time of year and much use is made of African female labour for weed control, harvesting, etc. This force varies from 10 to 60 depending on activities.

(e) **Experiment Techniques.**

Fertilisers and seeds for all experiments are weighed out on a plot basis, packeted, and code numbered at the Central Station in Maseru. All packaging is done prior to planting time. Those for district trials are sent out in waterproof, sealed refuse bins. Manure and Manure Ash, after analysis and subsequent moisture determination, is weighed out in grain bags, transported to the experiment and turned in as soon as possible. For drilling or seed dressing calibrated scoops are used in the field to obtain the quantity of fertiliser required for individual crop rows.

All experiments, except where specifically mentioned, are planted by hand. A high degree of precision is demanded. Fertilisers and manures except in the case of basal dressing for certain variety trials are similarly

hand applied. To ensure even stands of all row crops 2 or 3 seeds are planted per planting station. The stand being thinned to the required plant population after germination.

Concrete beacons, each moulded about a length of hollow tube, are buried in the sub-soil to mark experiment corners. Removable steel pegs inserted into the beacons then define the experiment exactly. Plot boundaries and row ends are measured with a tape and marked with reinforcing steel pegs. Strings are fitted at their ends with heavy gauge rubber, which when stretched and hooked over the steel pegs, keep them straight and taut. Chains previously calibrated, similarly hooked over the steel pegs mark the planting holes.

After thinning, row crop trials usually receive two hand and 3 tractor cultivations.

Discard rows are cut out with sickles after the first frost. For wheat discards a small motor scythe is used when the grain nears the hard dough stage. After weighing the total produce from the "nett" plots, cobs, heads or pods are bagged, sealed and transported to the Central Station for threshing and weighing. Small grains are beaten out by hand and winnowed while maize is shelled in small hand-operated machines. All grains are weighed twice — once after threshing and again 4 weeks later so as to check accuracy and account for any possible moisture loss. At Mokhotlong (Mountains) sampling techniques are used as the cost of flying out the produce for threshing at Maseru is prohibitive.

On the main station each experiment has mounted at one corner a record sheet, suitably protected against the weather, on which all treatments, cultural operations and observations are recorded. On the sub-stations these details are entered in the log book kept by the caretaker.

Rainfall is recorded at each sub-station and at the main station.

A progress board is maintained at the central station where each operation on each experiment in the territory is recorded by means of thumb tacks.

Experiment designs vary according to site and conditions, use being made of factorials, Latin squares and Randomised blocks, as well as split plot techniques in certain cases. For district work the 3 x 3 x 3 factorial was initially chosen as a standard design.

The dissection of arable land in Basutoland by horizontal contour banks and "vertical" and diagonal virgin land boundary strips at frequent intervals has made the lay-out of experiments in the Districts extremely difficult. The necessity for using broken and ill shaped blocks in many instances has considerably increased co-efficients of variation. Similar difficulties were encountered on the Maseru Experiment Station when yields on the whole were low and variable because of the infertility of the soil of the main arable block and the sharp fertility gradients caused by the necessary bull dozing down of old plough banks and land boundaries.

(f) **Reduction of Sub-Stations and Erection of Greenhouse.**

In 1954 the number of sub-stations was reduced from 11 to 10 and in 1956 from 10 to 6. The reasons for reducing the number of sub-stations were various, but is was generally true that in many instances district plots were replicates of others and were yielding little additional information. The six remaining are all typical for their soil type and ecological zone, and consist of one Mountain sub-station at Mokhotlong, one in the foothills

near Machache mountain, and four in the lowlands at Leribe, Teyateyaneng, Matsieng and Mafeteng. To increase operations at Machache the sub-station was enlarged in 1958 by the addition of a further 3 acres.

In 1957 a plastic green-house was erected at the Experiment Station and plot tests on trace elements were initiated. In March 1958 this temporary greenhouse structure was severely damaged in a storm. It has since been replaced by a permanent structure. The greenhouse has proved invaluable for initial exploratory experiments, allowing a rapid assessment of possible responses and work to be carried out on all soils during the cold winter months.

(3) CROP STUDIES:

The most important locally grown crops are Maize, Sorghum, Wheat, Peas and Beans. Recently potato production has shown a promising increase.

Maize is the predominat summer crop on the lowlands followed by Sorghum and beans, with Wheat and Peas being grown as a winter crop. In the foothills Maize, Sorghum, Peas, Beans and Wheat are all grown as summer crops, while in the mountains the main crops are Wheat and Peas with some Maize, Beans and Sorghum. Because of the ever present frost hazard these latter three crops yield successfully only very occasionally Frost is a most important limiting factor to crop production all over Basutoland, and even in the lowlands a period of 160 frost free days is the most that can be hoped for; and within this period mid summer frosts are frequent.

All crop studies during the period under review have been conducted with a view to ascertaining the most suitable varieties of the main crops that can be recommended to farmers in each particular ecological zone. New varieties are constantly included in the trials while the less promising ones are discarded once their inferiority has been established. Under this system it is conceivable that the varieties now being recommended will be superceded by others once they have proved their superiority. Variety trials will continue for many years.

Other crop studies have been devoted to the trial of new and other crops in the territory with a view to giving farmers new sources of income and a more varied agriculture.

Special mention must be made of the very fine co-operation and assistance that this station has received from the Department of Agriculture in the Union of South Africa, especially the Division of Chemical Services, Potchefstroom Agricultural Research Station and the Bethlehem Agricultural Research Station for advice and the supply of seeds.

(a) WHEAT:

(1) Lowlands:

Wheat is sown in the lowlands from April to late June (i.e. Autumn and Winter) and harvested in November-December.

Moisture requirements are met by the rainfall stored in the soil, usually fallow, during the previous summer and autumn, plus any occasional winter rain that might fall. While summer wheat is grown to a great extent in the adjoining province of the Orange Free State, it is not popular in the Basutoland lowlands. Wheat investigations for the lowlands have therefore been confined to early and late planted winter wheat.

Results for the last 6 years have been as follows: (1960 figures are not yet available).

Crop: 25 commercially available varieties.
Arrangement: 5 x 5 lattices with 4 replications.
Seeding: 40lb. per acre broadcast.

Basal fertiliser: 200lb. 19 per cent. Superphosphate per acre at sowing time plus 100lb. Limestone Ammonium Nitrate as a top dressing at stooling time.

TABLE 1.

Early Planted Winter Wheat in 200 lbs. bags/acre.

VARIETY	Rank on 6 Rankings	Rank on AV. Yield	Average Yield 6 Years	1954		1955		1956		1957		1958		1959	
				Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield
Scheepers	1	2	3.91	5	3.32	3	4.55	2	3.60	12	3.06	4	2.37	5	3.84
Red Victory	2	1	4.07	25	1.78	5	4.18	1	3.73	1	6.41	7	3.65	2	4.69
Lowland	3	3	3.55	10	3.00	4	4.48	5	3.26	3	4.70	3	2.58	12	3.28
Red Spitzkop	4	6	3.30	3	3.72	9	3.81	3	3.39	11	3.17	9	2.11	7	3.58
Red Egyptian	5	5	3.35	7	3.20	2	4.55	10	2.82	7	3.53	14	1.96	4	4.01
Rousseaus B.	6	13	2.94	8	3.18	17	3.53	4	3.32	2	5.05	10	2.11	9	3.46
White Spitzkop	7	7	3.16	1	3.84	15	3.55	8	2.97	8	3.32	17	1.82	11	3.37
Punjab	7	9	3.03	2	3.79	12	3.67	6	3.06	22	2.05	5	2.34	13	3.26
Mountain No. 1	9	4	3.40	24	1.98	18	3.52	14	2.69	4	4.18	2	2.92	1	5.10
Maluti	10	9	3.03	9	3.17	6	4.11	7	3.03	15	2.66	13	2.01	14	3.19
Sterling	11	8	3.07	12	2.91	8	3.84	16	2.48	9	3.29	18	1.74	3	4.14
Penkop	12	14	2.94	6	3.26	11	3.73	9	2.84	17	2.51	8	2.18	16	3.12
Queen Fan	13	11	2.97	17	2.65	1	4.82	25	1.14	5	4.17	11	2.07	17	2.95
Harpers	14	15	2.88	16	2.82	7	3.91	11	2.81	14	2.86	15	1.96	19	2.94
Impala	15	16	2.82	15	2.86	10	3.75	17	2.46	13	2.86	19	1.50	8	3.46
Goudveld	16	17	2.80	4	3.37	19	3.45	19	2.36	19	2.41	6	2.28	18	2.94
Mountain No. 2	17	12	2.97	21	2.36	13	3.64	12	2.81	2	5.23	22	1.40	22	2.34
Vorentoe	18	18	2.65	18	2.59	23	2.86	15	2.61	20	2.17	7	2.23	10	3.42
Talberg	19	19	2.61	22	2.34	14	3.63	13	2.74	6	3.91	23	1.28	25	1.75
Hoopvol	20	20	2.51	14	2.89	20	3.42	18	2.43	10	3.21	25	1.20	23	1.92
Daeraad	21	21	2.45	11	2.94	16	3.55	20	2.31	24	1.89	24	1.21	20	2.88
The following 4 varieties were withdrawn from the trial after 1958:															
Manitoba	22	22	2.32	20	2.40	25	2.74	24	1.85	16	2.57	12	2.03		
Sonop	23	23	2.28	13	2.89	21	3.34	23	1.92	25	1.84	20	1.41		
Lalkasarwate	24	24	2.26	19	2.43	24	2.81	21	2.27	23	1.98	16	1.84		
Duiker	25	25	2.16	23	2.09	22	2.95	22	1.92	18	2.44	21	1.41		
and replaced by the following 4 in 1959:															
354														6	3.67
Betmark														15	3.19
Betana														21	2.85
Bolane														24	1.89
Mean					2.87		3.70		2.67		3.14		1.99		3.01
S.E. Mean Yield ±	..	..	..	..	0.16		0.07		0.08		0.37		0.20		0.13

Early Planted: Sown before the end of April.
Late Planted: Sown early June.
Results: See tables 1 and 2.

TABLE 2

Late Planted Winter Wheat in 200 lbs. bags/acre.

VARIETY	Rank on 6 Rankings	Rank on Average Yield 6 years	Average Yield 6 years	1954		1955		1956		1957		1958		1959	
				Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield
White Spitzkop	1	2	3.48	1	2.47	13	4.65	11	3.52	4	4.25	9	1.94	2	4.03
Red Victory	2	1	3.81	25	1.29	1	5.85	1	5.28	17	3.22	1	2.62	1	4.59
Mountain No. 1	3	3	3.31	5	2.16	7	4.85	4	4.55	22	2.76	3	2.20	7	3.35
Maluti	4	8	3.13	3	2.41	6	5.03	9	3.66	9	3.63	4	2.20	24	1.84
Lowland	5	4	3.29	9	1.90	4	5.47	6	4.23	21	2.87	12	1.83	6	3.39
Red Egyptian	6	14	3.01	2	2.45	2	5.49	13	3.37	25	1.93	11	1.84	10	2.98
Scheepers	7	9	3.12	12	1.82	16	4.41	8	3.79	20	2.96	5	2.19	4	3.57
Goudveld	8	6	3.21	13	1.82	19	4.34	12	3.45	1	4.86	10	1.88	12	2.92
Red Spitzkop	9	7	3.15	4	2.25	12	4.65	7	3.81	5	4.16	23	1.47	18	2.57
Talberg	10	12	3.07	6	2.10	18	4.34	3	4.63	16	3.31	2	2.28	25	1.78
Queen Fan	11	5	3.25	23	1.52	5	5.22	2	4.80	18	3.17	8	1.97	15	2.80
Penkop	12	10	3.12	20	1.61	10	4.76	10	3.64	10	3.57	19	1.55	3	3.57
Impala	13	13	3.06	10	1.83	17	4.38	22	2.43	2	4.60	14	1.82	2	3.29
Harpers	14	16	2.97	17	1.76	11	4.74	18	2.97	12	3.41	16	1.76	9	3.09
Punjab	15	18	2.91	7	2.07	3	5.48	14	3.31	19	3.04	25	0.88	16	2.65
Mountain No. 2	16	11	3.09	22	1.55	14	4.55	5	4.55	8	3.76	15	1.81	21	2.31
Sterling	17	17	2.92	16	1.78	20	4.18	21	2.45	6	4.08	20	1.53	5	3.47
Rousseaus Bd.	17	15	2.98	15	1.81	8	4.82	16	3.15	11	3.42	17	1.75	11	2.95
Daeraad	19	19	2.71	11	1.83	9	4.80	25	1.25	3	4.36	22	1.52	20	2.51
Vorentoe	20	20	2.56	14	1.82	15	4.52	19	2.82	23	2.38	21	1.53	22	2.30
Hoopvol	21	21	2.23	21	1.56	21	4.10	24	1.69	24	2.36	24	1.41	23	2.28
The following 4 varieties were withdrawn from the trial after 1958:															
Lalkasarwate	14	18	2.86	8	1.94	23	3.63	15	2.38	14	3.37	6	2.04		
Sonop	20	22	2.66	18	1.74	24	3.57	20	2.58	13	3.40	7	2.02		
Manitoba	21	19	2.81	24	1.42	22	3.74	17	3.06	7	4.00	13	1.82		
Duiker	24	24	2.39	19	1.72	25	3.06	23	2.13	15	3.36	18	1.66		
and replaced by the following new varieties in 1959:															
Betmark														13	2.88
Bolane														14	2.81
Betana														17	2.64
354														19	2.54
Mean Yield					1.90		4.55		3.37		3.43		1.82		2.66
S.E. Mean Yield ±					0.17		0.05		0.17		0.74		0.35		0.22

Discussion: From tables 1 and 2 it appears that the variety Red Victory can safely be recommended for both early and late sowing in the lowlands while Scheepers is an alternative for early planting and White Spitzkop the alternative for late planting.

An interesting fact is the correlation between mean annual yield and the amount of winter and early spring rain.

It would appear that there is slight yield advantage from early planting over late planting when the 6 year average yield is considered.

(b) **Mountains and Foothills**

In both these zones Wheat is grown as a summer crop. Yields are much higher than for lowland winter wheat and the quality is usually excellent.

During 1953 90 samples of wheat were collected by Departmental field staff from the foothills and mountains and planted on an ear to row basis for observation at Mokhotlong. Because of bird damage and inaccessability the trial was moved to the foothill station in 1954. From these original samples the eight most promising were planted in a randomised block trial at Mokhotlong. As after 3 years it was apparent that no new variety was consistently superior to the others it was decided to multiply seed of all eight varieties and make these available to farmers. The first seeds of these new varieties were issued to farmers at Mokhotlong, Qacha's Nek and Semonkong in August of 1960.

For results of 4 years trial see table 3.

TABLE 3 (Mountain Wheat).

Wheat grain in 200 lbs. bags/acre.

VARIETY	RANK	4 YEAR AVE.	MEAN YIELD			
			1957	1958	1959	1960
W.M. 18	2	9.50	10.12	9.06	7.06	11.79
M.M. 54	1	9.63	9.74	9.80	7.42	11.74
E.R. 5	4	9.31	10.47	8.34	7.16	11.25
L.P. 79	6	9.17	9.14	9.74	6.72	11.08
E.K. 70	3	9.47	10.04	9.75	7.56	10.54
W.M. 14	5	9.20	10.15	10.26	6.23	10.14
J.N. 41	7	8.17	7.72	9.25	5.96	9.73
W.M. 68	8	8.04	7.72	9.36	5.66	9.40
Mean			10.10	9.44	6.72	10.71
S.E. Mean Yields ±			—	0.01	0.42	0.94
Var. Ratio			0.85	1.67	2.84	0.91
F. Requirement			20.60	2.28	2.30	2.30
Coeff. of Var.			2%	1.10%	15.17%	21.57%
L.S.D. (5%)			—	—	1.18	2.67

From the above table it would now appear that, while all these wheats are high yielders, little further attention should be paid to the varieties J.N.41 and W.M.68. The letters and numbers identifying these varieties represent the collectors' initials and the original sample number. It is not intended to alter the nomenclature at present.

(b) **Beans:**

Beans are grown mainly in the lowland and foothill areas of the Territory. There are numerous local varieties and types, but only a few of these are grown for sale, the rest being for home consumption.

Since 1954 a bean variety trial has been annually planted at the Experiment Station. Sixteen local and imported varieties are sown annually. In 1959 and 1960 a quick maturing bean variety trial was laid down at Mokhot-

long consisting of 8 varieties but, because of frost, no results were recorded. Due to frost bean production cannot be recommended for the mountain area, while only the quicker maturing types should be planted in the foothills.

The results of 7 years of Bean Variety trials in the lowlands are given in Table 4.

Arrangement: 4 x 4 Balance Lattice in 16 blocks of 4 plots each.
Spacing: 3 Feet between rows, with plants 9in. apart.
Basal: Fertiliser: 20lb. N. plus 50lb. P_2O_5 per acre.

TABLE 4.

Dry Beans in 200 lbs. bags per acre.

VARIETY	1954	1955	1956	1957	1958	1959	1960	5 Year Ave.
White Haricot	3.21		5.95		8.48	4.76	1.28	4.76
Khaki Sugar	5.19		2.90		8.55	4.68	1.35	4.53
Pink Wacher	4.66		2.98		6.78	3.74	0.95	3.82
Van Zyl Sugar	4.13		1.32		7.18	3.86	0.96	3.61
Black Zebra	2.44		1.84		7.00	4.21	0.68	3.25
Tepary	2.60		1.97		7.57	1.32	0.10	2.71
Purple Speckled	2.63		1.34		5.41	2.94	3.08	2.52
Khaki Speckled	3.26		—		7.67	4.77	1.29	—
Michigan Bombust	—		—		7.39	4.69	1.06	—
Canadian Wonder	—		1.19		6.95	3.52	0.81	—
Sugar Speckled	—		2.78		7.04	3.59	0.72	—
Red Sugar	—		1.58		6.50	3.59	0.68	—
Natal Yellow R.	—		—		7.06	3.09	0.58	—
Long Tom	—		—		6.33	2.60	0.56	—
Canary Yellow	—		1.47		7.54	3.18	0.46	—
Robust (Mich. Pea)	—		—		9.39	4.62	0.45	—
Yellow Sugar	3.23		—		—	—	—	—
Red Speckled	3.13		—		—	—	—	
Red Zebra	3.24		—		—	—	—	—
Cream Wacher	4.11		2.43		—	—	—	—
Black Wonder	2.17		2.27		—	—	—	—
Joko	—		0.56	—	—	—	—	—
Victory	2.38		0.33		—	—	—	—
Khaki Round	—		1.54		—	—	—	—
Mean	3.25		2.03		7.35	3.70	0.76	
S.E. Mean Yield ±	0.65		0.29		0.66	0.36	0.06	
L.S.D. 5%	—		0.84		1.86	1.03	0.16	
Coeff. of Var. %	—		16.84		17.90	19.60	29.60	
Var. Ratio	1.74		—		2.10	6.87	10.4	
F. Requirement	3.00		2.47		1.92	1.92	1.92	

Discussion: From the above table it will be seen that the small white haricot and khaki Sugar Beans have consistently yielded better than the other varieties on trial. Both these varieties however, are late maturing, so they must be planted by the end of November to ensure a crop. The Pink Wacher, a local Selection of pink haricot is much quicker to mature and can be planted until mid-January. The very low yields for the 1960 season are attributable to a severe drought during flowering time.

(c) **Pea:**

Large quantities of dried peas are produced in the mountains and foothills as a summer crop. Yields are good and quality is outstanding.

There is, however, a tendency for farmers to sow mixed seed with the result that their resultant income is appreciably lower. This practice cannot be too strongly deprecated and every effort must be made by the department to prevent the sowing of mixed seed. In the lowland some peas are grown as a winter crop, being sown from May to August and harvested in November and December.

Two local varieties are commonly grown in Basutoland known to the trade as Basuto Yellow and Basuto Green. These two have consistently outyielded other varieties but they take approximately 4 weeks longer to mature than Black-eyed Susan which is a serious drawback in a short summer. The results of a 3 years' trial at Mokhotlong embracing 2 local varieties and eight South African varieties are given in Table 5.

TABLE 5. (Mountain Peas).

Dried Peas in 200 lbs. Bags per acre.

VARIETY	MEAN YIELD			3 YEAR AVERAGE
	1958	1959	1960	
Basuto Yellow	13.87	5.09	10.30	9.75
Basuto Green	11.29	2.48	12.65	8.81
Black-eyed Susan	6.21	3.92	5.12	5.08
Wando	5.89	2.21	3.58	3.89
Orange Kroon	4.92	1.98	3.73	3.54
Tuinbou Sel. 20-1	5.24	1.89	2.77	3.30
Stratagem	5.08	2.17	2.58	3.28
Stomppeul	4.52	2.21	2.99	3.24
Greenfeast	3.23	1.41	3.23	2.62
Onward	3.63	1.63	1.80	2.42
Mean	6.39	2.50	4.87	4.59
S.E. Mean Yield ±	0.63	0.17	4.87	—
L.S.D. 5%	1.78	0.49	0.80	—
Var. Ratio	29.90	42.39	163.01	—
F. Requirement	2.15	2.15	2.15	—

It is clearly evident from these results that the two local varieties are far superior to the South African ones. Provided they can be planted early enough they should always be preferred, more especially the green which has a higher market value. When planting has to be delayed the Black-eyed Susan variety is preferred.

(d) **Maize:**

Maize forms the staple diet of most of the Basotho; and is grown throughout the territory, although the mountains are not ecologically suited to its production. Because of the frost hazard maize experiments at Mokhotlong have been abandoned.

The great preponderance of maize over other crops grown in Basutoland has meant that most fertility trials have used maize as the test crop.

The very poor standards of Agriculture and Animal Husbandry in Basutoland, which result in many draught animals being too thin to plough after the first spring rains results in the late sowing of many crops. For this reason Early and Late planted Maize variety trials have been conducted in the lowlands, together with some Maize trials at Mokhotlong.

Although the planting of hybrid Maize seed cannot at present, be advocated in Basutoland because of the low standard of basic agronomic

practices, single and double hybrids, mainly from the Union have been included in the trials.

It has been clearly established that by proper soil preparation, weed control and the use of pure seed of open-pollinated varieties, production per acre can be doubled, while with the use of fertilisers production can be trebled thereafter.

To introduce hybrid seed at this stage, before the level of agriculture has been raised would be most unwise.

In 1952 the first Maize variety trial was planted, but due to the ravages of trespassing stock and insects was later abandoned. During 1954 and 1955 maize variety trials using 25 varieties were carried out at the Main Station.

The design was a triple lattice with 15 blocks of 5 plots each and the maize received a basal dressing of 200lb. per acre 1:1 Supers and Raw Phosphate mixture, drilled below the seed. For results see table 6.

TABLE 6: MAIZE 1954-55.

Maize Grain in 200 lbs. bags per acre.

	VARIETY	1954	1955	2 YEAR AVERAGE
1.	K.64 x P.P. Top Cross	14.55	8.89	11.72
2.	S.A. 200 double hybrid	15.06	7.97	11.52
3.	K.64 x A.W.F. Top cross	13.96	7.66	10.81
4.	Potchefstroom Pearl	12.42	7.84	10.13
5.	Golden Beauty	12.16	7.34	9.75
6.	Anveld	12.67	6.28	9.48
7.	American White Flint	12.35	6.25	9.31
8.	Teko Yellow	11.67	6.62	9.15
9.	Natal-8-Row	11.23	6.46	8.85
10.	Early Pearl	11.93	5.54	8.74
11.	Early King	11.30	6.08	8.69
12.	Eksteen	11.74	5.41	8.58
13.	Yellow Bushman	11.39	5.21	8.55
14.	Mic's Success	11.57	5.42	8.50
15.	Synthetic Potch. Pearl	11.22	5.38	8.30
16.	Silver King	10.42	5.72	8.07
17.	Synthetic Anveld	10.76	5.23	8.00
18.	Peruvian	10.97	4.50	7.74
19.	White Bushman	10.28	4.96	7.62
20.	Cincinatti Bushman	10.56	4.03	7.30
	Basuto White	11.92		
	Wisconsin	11.59		
	Hickory King	11.52		
	Newberry	11.46		
	Rooistronk	10.80		
	Topbrid		7.70	
	Kalahari Early Pearl		6.46	
	Iowa Silver Mine		5.16	
	New England		4.80	
	Kroonstad Robyn		3.57	
	Mean	11.84	6.02	9.04
	S.E. Mean Yields ±	1.02	0.87	
	L.S.D. 5%	2.03	1.77	

In 1956 the maize variety trials were changed to include early planted and late planted experiments. 16 Varieties were compared in the early planted trial on a newly levelled site but no significanc could be attached to

yield differences. Nine short season varieties were tested for December planting. All were caught by frost before maturity.

The early planted maize variety trials using 16 varieties have been continued to date, but the 1957 and 1958 crops failed. Results for 1959 and 1960 are presented in Table 7.

TABLE 7: EARLY PLANTED LOWLAND MAIZE.

Maize Grain in 200 lb. Bags per acre.

	VARIETY	1959	1960	2 YEAR AVERAGE
1.	P.P. x K. 64 Top Cross	10.87	12.32	11.60
2.	Golden Beauty	8.50	11.18	9.84
3.	S.A. 4	7.97	11.45	9.71
4.	Natal-8-Row	8.79	10.36	9.58
5.	S.A. 200	8.31	10.82	9.57
6.	American White Flint	7.91	10.48	9.20
7.	Yellow Bushman	8.03	10.20	9.12
8.	White Bushman	6.61	10.80	8.71
9.	Mic's Success	7.59	6.97	7.28
10.	Early King	7.26	7.27	7.27
11.	Anveld	6.79	7.68	7.23
12.	Kroonstad Robyn	5.88	6.84	6.36
13.	Silver King	5.66	6.97	6.32
	K. 64 x A.W.F.		12.33	
	B. 7211		11.89	
	Sahara Yellow		7.27	
	E.K. x K. 64	9.56		
	S.A. 9	8.52		
	Potchefstroom Pearl	6.80		
	Mean Yield	7.81	9.68	8.60
	S.E. Mean Yields ±	0.64	0.69	
	L.S.D. (5%)	1.82	1.96	
	Variance Ratio	4.36	9.19	
	F. Requirement	1.92 (approx.)	1.92 (approx.)	
	Coeff. of Variance	16.43%	14.36%	

Since 1957, seven quick maturing varieties have been compared in a randomised block experiment. For results see Table 8.

Discussion:

The results shown in Tables 7 and 8 make it clear that the yellow and white flint types of maize are superior yielders to the Dent types under the conditions occurring in the Basutoland Lowlands. Dent types are unsuitable for the foothills because of their longer growing season. It is therefore suggested that, in future, the department recommends the planting of the following open-pollinated varieties in both the lowlands and foothills:

(a) **Early planted White maize:** American White Flint and White Bushman.
(b) **Early planted Yellow maize:** Golden Beauty and Natal 8-Row.
(c) **Late planted White maize:** White Bushman.
(d) **Late planted Yellow maize:** Natal 8-Row.

Mountain Maize: At Mokhotlong maize variety trials were conducted in 1958, 1959 and 1960. The 1960 crop was completely destroyed by frost and no yields were recorded. The successful growing of maize in the

mountain areas is exceedingly problematical due to the ever present danger of frost. For this reason the growing of Maize in the mountains cannot be recommended. Wheat is a far more reliable and paying crop for these areas. Results for 1958 and 1959 are given in Table 9.

TABLE 8: LATE PLANTED LOWLAND MAIZE.

Maize Grain in 200 lb. Bags per acre.

	VARIETY	1957	1958	1959	1960	4 Year Average
1.	S.A. 200	19.02	13.26	9.12	9.33	12.68
2.	Natal-8-Row	16.32	9.14	7.59	8.86	10.48
3.	White Bushman	15.64	7.95	9.23	8.07	10.22
4.	Cincinatti	14.97	8.29	7.24	9.04	9.89
5.	Yellow Bushman	15.42	7.89	6.62	8.44	9.59
	Wisconsin	15.42	9.01			
	American White Flint			5.79	8.02	
	Golden Beauty				10.72	
	Eksteen		8.99			
	Peruvian	14.68				
	Mountain Selection			9.35		
	Mean Yields	15.92	9.22	7.84	8.92	
	S.E. Mean Yields ±	0.56	0.56	0.38	0.39	
	L.S.D. (5%)	—	1.62	1.08	1.11	
	Var. Ratio	6.87	10.88	13.70	5.65	
	F. Requirement	2.51	2.42	2.42	2.42	
	Coeff. of Var.	7.84%	—	11.91%	10.75%	

TABLE 9: MOUNTAIN MAIZE.

Maize Grain in 200 lb. Bags per acre.

	VARIETY	1958	1959	1960	3 YEAR AVERAGE
1.	S.A. 200	14.71	3.35	0.00	6.02
2.	Cincinatti	12.47	2.90	0.00	5.12
3.	White Bushman	11.14	2.95	0.00	4.70
4.	Eksteen	11.92	2.13	0.00	4.68
5.	Yellow Bushman	10.17	2.86	0.00	4.34
6.	Bread Maize	9.44	3.40	0.00	4.28
7.	Natal-8-Row	11.14	1.77	0.00	4.23
	Early King		0.42	0.00	
	Wisconsin	11.37			
	Mean	11.54	2.47	0.00	4.77
	S.E. Mean Yields ±	0.59	0.22		
	L.S.D. (5%)	1.74	0.62		
	Variance Ratio	7.26	20.79		
	F. Requirement	2.49	2.49		
	Coeff. of Variance	10.2%	17.78%		

Discussion:

If farmers will persist in planting maize in the mountain areas then Cincinatti must be recommended for yellow maize and White Bushman for the white varieties.

(e) **Sorghum:** is the second most popular crop grown in Basutoland.

Investigations as to the best varieties were started in 1953 but have been dogged by misfortune almost ever since.

In 1953 289 lines of sorghum were collected and together with 5 South African varieties were planted at Machache sub-station on an ear to row basis for observation and selection. At the main Station a trial of 5 South African varieties and the standard variety used on all Sorghum fertility trials (Tennant White)was laid down. Because of extremely poor soil conditions and late planting (November 4th) two varieties failed to mature before the frost and no yield figures were presented.

In the same year, 1954, the yields presented in Table 10 were harvested from 3 non-replicated test plots at Maseru, Berea and Leribe.

TABLE 10: LOWLAND SORGHUM 1954 IN 200 LB. BAGS PER ACRE.

Long Red Kaffir	14.20
Tennant Dwarf White	12.70
Texas Martin	9.61
Short Red	8.13
Bird Proof	7.13
Mean Yield	10.35

In the lowlands Sorghum variety trials were laid down in 1955, 1956, and 2 in 1957 but all failed for various reasons such as frost, hail, bad germination, etc. In the foothills 8 lines were selected for trial from an original 360 samples in 1958, but the trial failed because of damage by spring floods. In 1959 the same trial was destroyed by hail. The 1960 results are presented in Table 11. Bad Germination unfortunately gave a high co-efficient of variation.

Treatments: 8 selected local sorghum varieties.
Arrangement: 4 randomised blocks of 8 plots each.
Soil Type: Foothill Red Loam.

TABLE 11: SORGHUM VARIETY TRIAL (FOOTHILLS).

Grain in 200 lb. Bags per acre.

VARIETY NO.	YIELD.
43	3.81
46	3.83
44	3.34
47	3.07
42	3.03
41	1.72
45	1.68
48	1.45
Mean	2.70
S.E. Mean Yields ±	0.45
L.S.D. (5%)	1.27
Variance Ratio	4.38
F. Requirement	2.49
Coeff. of Variation	33.19%

Discussion:

From the aforegoing story of setbacks it will be seen that little information is available as to which sorghum varieties should be planted. Until this

information is forthcoming it would appear from observations that Tennant White, David Makanya (Long Red) and the new Union Bred Framida are the ones to be recommended.

(f) **Sunflowers:**

Sunflowers are not grown to any extent in the territory, but because of their ability to withstand light frosts could be an ideal replacement for maize in the mountain areas. Because of their short period of maturation they could also prove a useful late crop in the lowlands.

There is little demand, at present, for the seeds in Basutoland but they could be used to supplement poultry rations and, perhaps, as a source of cooking oil, should an expressing plant be built in the territory. The remaining "cake" could then be incorporated in stock rations.

Since 1955 observations have been made on Sunflowers at Maseru and Mokhotlong. In 1959 and 1960 they were discontinued at Maseru. Results from the Mokhotlong plots are given in Table 12.

TABLE 12 (MOUNTAINS SUNFLOWER).

Yield in 100 lb. Bags per acre.

VARIETY	YIELD 1959	1960	AVERAGE
1. Russian Black	4.87	9.54	7.21
2. Giant Striped	2.99	10.82	6.91
3. Mars	4.51	8.14	6.33
4. Jupiter	4.17	7.10	5.64
5. Giant White	4.02	6.98	5.50
6. Saturn	4.40	6.40	5.40
7. Polestra	4.57	5.58	5.08
8. Southern Cross	5.07	4.48	4.78
9. Sunrise	6.26	2.91	4.59
10. Ella	4.78	4.13	4.46

In 1960 a ¼ acre plot was sown and treated as a farm crop at Maseru to ascertain yields that could be expected by farmers. The variety Russian Black was sown and yielded 1,268¾lb. per acre.

It would appear that the variety Russian Black is the most suitable variety for the Basutoland Mountain areas.

(g) **Cowpeas**

Cowpeas are grown to a very limited extent in Basutoland, but should be more extensively cultivated to provide winter feed for livestock, as a green manure crop and for incorporation in crop rotation system.

In 1955 and 1956 cowpea observation plots were laid out at Maseru. From 1957 to 1960 a 4 replicate 4 x 4 simple lattice variety trial using 16 varieties has been conducted. The 1957 crop failed. Results for the subsequent years are tabled in Table 13.

TABLE 13: (COWPEA VARIETIES).

Grain in 200 lb. Bags per acre.

VARIETY	MEAN YIELDS 1958	1959	1960	AVERAGE
1. New Era	6.08	5.64	1.78	4.50
2. Farm Seed	5.91	5.82	1.63	4.45
3. Witsenberg	5.58	4.80	1.92	4.10
4. Iron Grey	4.32	6.09	1.89	4.07
5. White Wonder	4.32	5.78	1.63	3.91
6. Dr. Saunders (1)	6.55	3.82	1.07	3.81
7. Dr. Saunders (2)	4.04	3.48	0.81	2.71
8. 51—C—57	4.12	3.03	0.58	2.58
9. 53—C—29	4.15	2.44	0.51	2.37
10. 51—C—295 (1)	3.61	2.50	0.49	2.20
11. 51—C—299	4.20	2.05	0.30	2.18
12. 51—C—267	3.50	2.28	0.54	2.11
13. 51—C—295 (2)	3.22	2.48	0.61	2.10
14. 51—C—277	3.53	2.17	0.59	2.09
15. 51—C—42	1.82	2.19	0.29	1.43
16. 51—C—421	1.01	2.50	0.49	1.33
Mean	4.12	3.57	0.95	2.88
S.E. Mean Yields ±	0.42	0.51	0.08	
L.S.D. (5%)	1.19	1.43	0.24	
Coeff. of Var.	20.50%	28.38%	35.7%	
Var. Ratio.	11.91	9.12	12.8	
F. Requirement	1.92	1.92	1.92	

Discussion: The prostrate well known varieties are definitely the better yielders in Basutoland.

(h) **Castor Beans:**

No castor is grown in Basutoland. It is a crop which could be successfully grown in the territory. In 1954, 1955 and 1956 basic fertility trials using a spineless dwarf variety from the Union were carried out. There were significant responses to Phosphates and Lime.

In 1960 a variety trial comparing 9 new varieties supplied by Messrs Gunson Seeds was carried out.

Treatment: 9 new Castor varieties.

Arrangements: 4 blocks of 9 randomised plots.

Yields: See Table 14.

TABLE 14: CASTOR VARIETIES.

Grain in 200 lb. Bags per Acre.

VARIETY	MEAN YIELDS
UC-53	4.07
B. 415	3.91
SMF-D15	3.91
R1-1123	3.67
SM-F.C.	3.64
SMF-GR.	3.62
R1-1118	3.49
R1-912	3.33
S. 56	3.22
Mean	3.65
S.E. Mean Yields ±	0.30
L.S.D. (5%)	0.84
Var. Ratio	0.88
F. Requirement	2.36
Coeff. of Variation	16.19

Discussion: Only UC-53 was significantly better than S-56. No importance should be attached to these results for the present.

(i) **Groundnuts:**

Observation plots were laid out on 2 different soils at the Main Station to ascertain possible yields of groundnuts using the quick maturing variety P.1802 obtained from the Union. No other varieties were tested as they all mature in more than 140 days. Results are given in Table 15.

TABLE 15: GROUNDNUT OBSERVATIONS.

Yield in Pounds per Acre.

SOIL TYPE	YIELD UNSHELLED	SHELLING PERCENTAGE
Grey-Brown Sandy Loam	1222	54.4%
Red Sandy Loam	896	44.2%

Discussion: It would appear that this quick maturing variety can be successfully grown on the grey soils of the lowlands, but it is essential that they be planted during October. Because of the nutritional value of the groundnut in the diet of the people, every effort should be made to encourage production. The haulms would form a valuable supplementary feed for livestock in winter.

(j) **Linseed** is not grown in Basutoland. It was thought to have possibilities as a high price winter season cash crop in the lowlands, maturing in time to be followed by a crop of summer maize. After variety trials in 1954 and 1955 it was found that it is liable to frost and drought damage in the spring unless planted very late on fallowed land. Yields from both trials were low. Those for 1955 showed no significant differences and are not presented. 1954 yields are shown in Table 16. In October 1960 a variety trial was started at Mokhotlong to test the possibilities of Linseed as a Summer Crop in the Mountains.

TABLE 16: (LINSEED VARIETY TRIAL 1954).

Linseed Grain in 200 lb. Bags per Acre.

VARIETY	YIELD
Klein	2.45
Royal	2.11
Eng. Branding	2.08
H. x E. 3076	1.86
Walsh	1.85
M.A. 330	1.53
H. x E. 1479	1.46
Punjab x Walsh	1.19
Punjab Set	1.00
Mean	1.73
S.E. Mean Yields ±	0.40
L.S.D. (5%)	1.28
Variance Ratio	5.61
F. Requirement	2.34

(k) Soya-beans:

In 1954 observation plots on Soya-beans were laid out in the lowlands. Yields are presented in Table 17.

TABLE 17: SOYA BEAN OBSERVATIONS.

Grain Yields in 200 lb. Bags per Acre.

VARIETY	YIELD
51.S.137	7.26
Blyvoor	7.25
51 S.57	5.35
51.S.262	4.56
34 S.51	4.35
51.S.54.3	4.16

(l) Other Observations:

During the period under review other observations have been made, or are being made, on the following crops: Potatoes, Turkish Tobacco, Burley Tobacco, Pyrethrum, indigenous and exotic grasses and clovers. No reliable results are available as yet.

(4) BASIC FERTILITY STUDIES:

On the establishment of the Station in 1952/53 it was essential that the first investigations into the fertility status of Basuoland soils be basic. Before more complicated experiments could be conducted it was necessary to ascertain whether there would be responses from N, P & K fertilizers, what interrelationships there were between lime, manure and phosphate-fertilizers, and what form of phosphatic fertilizer would be most suitable.

In the early stages of the programme there were initial technique finding difficulties to be overcome as well as other troubles. In 1953 the first 22 trials of the N.P.K. series were harvested.

(1) The Nitrogen, Phosphate and Potash Exploratory Series.

Careful consideration was given to the relative value of highly replicated designs used at a few centres and single replicate lay-outs at

many and it was decided not to sacrifice geographical coverage for increased precision per trial for this series.

Not only was a measure of the fertility status and fertiliser requirements of the various soils sought, but also some indication of the shape of the increment curves. The 3 x 3 x 3 single replicate factorial design was used throughout.

Trials were conducted on Maize, Wheat and Sorghum from 1953 to 1955 at 11 and later 10 sub-stations throughout the territory. These were:—

Lowlands: Leribe, Berea (T.Y.), Matsieng, Mafeteng, Mohale's Hoek, Fort Hartley.

Foothills: Qalo, Machache, Malealea.

Mountains: Mokhotlong, Qacha's Nek.

During 1956 the number of sub-stations was reduced from 10 to 6 which are still in operation at Leribe, Berea (T.Y.), Matsieng, Mafeteng, Machache and Mokhotlong. The N.P.K. experiments on Wheat, Maize and Sorghum were concluded on all substations except Mokhotlong in 1958. The Maize N.P.K. trial at Mokhotlong was concluded in 1959, but the wheat trial continues. No N.P.K. trials on Sorghum were conducted at Qacha's Nek and Mokhotlong as these areas are climatically unsuited to its production.

Details of the 175 experiments comprising the N.P.K. series are not given in this review. They are available in the Departmental Annual Reports for 1953-1959.

These experiments have shown that all Basutoland soils are deficient in phosphates. The mountain black clay soils are essentially fertile, but after 4 or 5 years of continuous cropping at a high level even they respond to the application of phosphates. The optimum rate of phosphate application appears to be 50lb. P^2O^5 per acre.

No significant responses to Potash have been recorded from 136 experiments. It can therefore be assumed that the addition of Potassic fertilisers will be unnecessary until soils have been cropped intensively for a period of years.

Responses to Nitrogen have varied according to soil and crop.

The N.P.K. series has shown that:—

(1) **Maize** responds well to phosphates plus nitrogen. The interaction of N & P gives increased yields of the order of 200 per cent. The typical pattern from 5 experiments in the lowlands in 1959 being:—

	P_0	P_2	Yields in 200 lb. Bags per Acre.
N_0	5.20	8.21	
N_2	5.99	13.55	

N_0=No Nitrogen.
P_0=No Phosphate.
N_2=40lb. N. per acre.
P_2=50lb. P_2O_5 per acre.

Sorghum: responds well to phosphates but nitrogen applications do not give yield increases.

Wheat: Responds well to phosphates and responses to nitrogen are governed by climatic conditions.

TABLE 18 (Ex M.P.1).

FORMS AND RATES OF PHOSPHATES.

Grain in 200 lb.. Bags per Acree.

	TREATMENT	MEAN YIELDS							
		Maize 1954	Maize 1955	Maize 1956	Maize 1957	Beans 1958	Maize 1959	Maize 1960	Average Yield
1.	B.S. 2 = 200 lb. Basic Slag	—	—	7.84	FAILED DUE TO THEFTS	3.92	10.40	8.35	7.63
2.	B.S. 1 = 100 lb. Basic Slag	—	—	6.57		3.82	9.87	8.17	7.11
3.	R. 2 = 200 lb. Raw Moroccan Rock Phosphate	5.34	6.90	8.37		3.16	9.99	8.09	6.98
4.	R. 1 = 100 lb. Raw Moroccan Rock Phosphate	4.31	7.09	7.91		3.56	9.79	9.14	6.97
5.	S. 2 = 200 lb. 19% Superphosphate	5.81	6.78	7.32		3.35	9.64	8.27	6.86
6.	S.R. 2 = 200 lb. 1:1 Mixture Supers and Rock	5.69	6.40	7.39		3.21	10.14	7.96	6.80
7.	S. 1 = 100 lb. 19% Superphosphate	5.70	6.08	7.22		3.38	10.20	8.10	6.78
8.	S.R. 1 = 100 lb. 1:1 Mixture Supers and Rock	4.82	6.30	7.27		3.66	9.58	7.79	6.74
9.	L 2 = 600 lb. "Langfos"	3.93	6.59	7.50		3.28	10.01	7.88	6.53
10.	L 1 = 300 lb. "Langfos"	3.78	6.20	7.85		3.09	9.99	8.11	6.50
	Mean	4.61	6.26	7.52		3.44	9.96	8.19	6.89
	S.E. Mean Yields ±	0.50	0.36	0.26		0.19	0.35	0.33	
	L.S.D. (5%)	1.44	1.02	0.75		0.53	0.98	0.93	
	Coeff. of Variation	—	—	—		—	9.18%	10.58%	
	Variance Ratio	5.9	6.4	3.49		14.41	0.91	1.29	
	F. Requirement	2.07	2.07	2.07		2.07	2.07	2.07	

(2) **Phosphate Studies:**

In 1954 trials were laid out at Maseru and in the Tebetebeng Valley to compare various forms and rates of application of phosphates. The experiment at Tebetebeng failed in that year and was not continued. The results of this important trial at Maseru are given in Table 18.

Arrangement: Randomised blocks with 7 blocks of 10 plots each.

Soil Type: Lowland grey brown sandy loam.

Treatments: are as detailed in Table 18.

The B.S.1 and B.S.2 treatments were introduced for the first time on double control plots for the 1955/56 crop, and were thus being compared with "third year continuous" treatments. It was considered that the "no phosphate" control was becoming meaningless in that hardly any grain is obtained in the continued absence of phosphate dressings. The S.1 treatment has been considered as control since then.

Discussion: While there is little difference between treatments to date it would appear that in future more attention should be paid to Basic Slag.

With a view to increasing yield by the use of phosphates and maintaining these yields at a high level, it is suggested that the Departmental policy should be to advise the use of Superphosphate for the first 4 or 5 years to convince the user of its benefit due to immediate visible responses while at the same time building up some reserves of phosphate in the soil. The farmer should then change to using a mixture of Supers and Raw phosphate for 2 or 3 years. This will maintain yields while building up further reserves in the soil. Once phosphate reserves are built up in this manner only Raw Rock phosphate or perhaps basic slag should be used.

(3) **Lime Studies:** In 1953/54 two simple experiments comparing 5 rates of lime were laid out at Berea (Teyateyaneng) and Matsieng.

Arrangement: At Matsieng: 5 x 5 Latin Square. At Beera: Randomised Blocks.

Soils: At Matsieng: A red sandy loam. At Berea: A grey brown sandy loam. Both soils are typical of those occurring in the lowlands.

Basal: 200lb. Superphosphate per acre. Agricultural Lime was applied in Spring of 1953 (80 per cent. $CaCo_3$). For treatments and results from 1954 to 1960 see Tables 19 and 20.

TABLE 19: LIME ON GREY BROWN SANDY LOAM.

Grain Yields in 200 lb. Bags per Acre.

BEREA

Lime Rate per Acre	Year	1954	1955	1956	1957	1958	1959	1960
	Crop	Maize	Maize	Maize	Beans	Maize	Maize	Maize
None		11.09	8.76	4.06	2.17	10.40	5.99	6.70
1000 lb.		12.20	6.52	4.46	2.13	11.19	6.79	6.96
2000 lb.		12.05	6.46	4.93	4.17	11.02	6.59	6.32
3000 lb.		10.58	6.92	4.16	4.48	7.31	6.96	5.62
4000 lb.		10.09	5.83	4.05	4.38	3.66	6.22	4.52
Mean		11.20	6.30	4.33	3.67	8.72	6.51	6.02
S.E. Mean Yields ±		0.69	0.43	0.21	0.33	0.68	0.46	0.55
Variance Ratio		1.76	1.34	2.62	9.18	22.90	0.76	3.35
F. Requirement		3.26	3.26	3.26	3.26	3.26	3.26	3.26
L.S.D. (5%)		—	—	—	—	—	—	1.51

TABLE 20: LIME ON RED SANDY LOAM.

Grain Yields in 200 lb. Bags per Acre.

MATSIENG

Lime Rate per Acre	Year	1954	1955	1956	1957	1958	1959	1960
	Crop	Maize	Maize	Maize	Beans	Maize	Maize	Maize
None		9.55	7.45	3.21	3.02	15.53	12.09	2.83
1000 lb.		11.42	7.37	3.05	3.31	15.51	11.82	3.75
2000 lb.		12.06	7.76	3.95	3.54	17.34	11.35	4.00
3000 lb.		12.72	8.29	4.81	3.63	16.28	10.51	4.09
4000 lb.		12.90	8.26	4.63	3.46	16.41	13.16	4.01
Mean		11.73	7.83	3.93	3.39	16.13	11.77	3.73
S.E. Mean Yields ±		0.42	0.47	0.36	0.19	0.60	0.83	0.37
Variance Ratio		11.19	0.10	5.05	2.62	1.05	1.31	1.93
F. Requirement		3.26	3.26	3.26	3.26	3.26	3.26	3.26
L.S.D. (5%)		—	—	—	—	—	—	1.06

Discussion: It is interesting to note the effects of liming after seven seasons of cropping. On the grey soil the heavy lime applications caused significant depressions in the 1960 crop. The yield depressions for 1958 and 1960 were most certainly caused by an induced iron deficiency on this lightly buffered soil. From 1958 the maize crop on this soil showed signs of iron chlorosis. The bean crop in 1957 responded to the lime treatments.

On the red soil a significant response to lime occurred in 1960. Previous to this there had been no significance.

It would appear from the above that lime should not be applied to the lightly buffered grey soils of the lowlands, but that it may have a slight beneficial effect on the red soils. It is doubtful, however, whether the application of lime to the red soils would be economic due to the high cost of transporting it from the sources of supply, all of which are far from Basutoland.

In 1957 and 1958 two trials were laid down at the Experiment Station, one on grey-brown sandy loam and the second on red sandy loam. The trials were to compare rates and forms of Lime in the presence and absence of Superphosphate and Manure.

Treatments per acre: O=No lime.

1 Mg.=1 Ton Dolamitic Lime.
2 Mg.=2 tons Dolamitic Lime.
3 Mg.=3 Tons Dolamitic Lime.
1 Ca=1 Ton Calcitic Lime.
2 Ca=2 Tons Calcitic Lime.
3 Ca=3 Tons Calcitic Lime.

P=50lb. P_2O_5 as Superphosphate.

D=50lb. P_2O_5 as Manure.

Arrangement: Randomised blocks with split plots. For results see Tables 21 and 22.

TABLE 21: FORMS AND RATES OF LIME WITH MANURE AND PHOSPHATE.

Grain in 200 lb. Bags per Acre.

Grey-Brown Sandy Loam.

Treatment	With Manure		With Superphosphate		Mean	
	1957 Maize	1958 Beans	1957 Maize	1958 Beans	1957	1958
(—)	10.79	4.17	6.57	3.75	8.68	3.96
1 Ca.	10.46	4.48	3.45	5.14	6.95	4.81
2 Ca.	9.69	4.30	4.67	5.12	7.18	4.71
3 Ca.	10.27	5.36	3.49	3.75	6.88	4.55
1 Mg.	10.08	5.70	4.44	5.33	7.26	5.51
2 Mg.	11.65	4.79	6.41	4.83	9.03	4.81
3 Mg.	11.52	5.57	7.00	4.61	9.26	5.09
Mean	10.59	4.75	5.35	4.68	7.97	4.72
S.E. Mean Yields ±	—	—	—	—	1.24	0.68

TABLE 22: FORMS AND RATES OF LIME WITH MANURE AND PHOSPHATES

Grain in 200 lb. Bags per Acre.

Red Sandy Loam.

Treatment	With Manure		With Superphosphate		Mean	
	1957 Maize	1958 Beans	1957 Maize	1958 Beans	1957	1958
(—)	7.84	5.90	6.76	3.87	7.30	4.08
1 Ca.	7.84	6.63	6.61	4.64	7.23	5.27
2 Ca.	7.63	5.25	6.93	5.84	7.30	6.18
3 Ca.	7.09	5.73	6.92	5.48	7.00	5.36
1 Mg.	7.75	7.03	6.96	5.87	7.35	6.45
2 Mg.	8.73	5.80	6.82	5.34	7.77	5.57
3 Mg.	8.94	5.73	5.83	5.90	7.38	5.81
Mean	7.96	5.72	6.70	5.22	7.33	5.53
S.E. Mean Yields ±	—	—	—	—	0.15	0.40

Discussion: The trials had to be abandoned due to lateral sub-surface water movement on the solonetzic grey brown soils and due to creep of carbonate down the slope on both sites.

No conclusions should be drawn from these results, but the lime applications again produced signs of iron chlorosis on the maize but not the beans on the grey soil.

(4) **Potash Studies:**

As a result of the N.P.K. exploratory studies which showed no responses to potash from 136 results no specific potash trials have been conducted. The soils of Basutoland are not deficient in potash and cereals and legumes do not respond to added K.

It is possible however, that once land has been intensively cropped for a number of years, and the potash reserves in the soil depleted, that responses to potash will be obtained.

(5) **Nitrogen Studies:**

(a) **Rates of N, Spacing and Time of Application:**

A feature of many years' work on Nitrogen manuring of Maize in Southern Africa has been the lack of response obtained, even in some better watered regions. Most of this work was carried out on maize planted at a standardised plant population per acre. In the light of American experience in fairly dry regions (25—30 inches) where "drought damage" in many instances was found in fact to be a symptom of Nitrogen deficiency and where nitrogen plays so important a role in maize production, and of the growing importance of nitrogen in maize culture in Central and East Africa, it seemed worth while to reopen the question in Basutoland. A trial with maize embodying four rates of nitrogen and four espacements was started at Maseru in November 1953 and continued until 1958 with minor adaptations.

Treatments were:

S_1 = Plants 6in. apart in 3ft. rows.
S_2 = Plants 12in. apart in 3ft. rows.
S_3 = Plants 18in. apart in 3ft. rows.
S_4 = Plants 24in. apart in 3ft. rows.
N_1 = 20lb. N. per acre as Sulphate of Ammonia.
N_2 = 40lb. N. per acre as Sulphate of Ammonia.
N_3 = 60lb. N. per acre as Sulphate of Ammonia.
T_1 = Half N. at planting, half at 1st flowering.
T_2 = All N. at 6 weeks after planting.
T_3 = Half N. at 6 weeks, half at 1st flowering.

Sulphate of Ammonia was placed in a band 3in. from the plants on the uphill side for all times of application.

At the start there were large responses to nitrogen application, but not to time of application or spacing. From the 2nd year it appeared that nitrogen applied at planting time was inferior to later applications.

Subsequently it was confirmed that:—

(1) The best time to apply Nitrogen is at 6 weeks after planting.
(2) Responses to Nitrogen are only significant when plants are 18in. apart or less. Because of moisture considerations it would appear that the optimum spacing of maize is 12in. to 15in. (13,500—14,500 plants) per acre.
(3) A minimum of 30lb. N. should be applied per acre.

The above conclusions are well shown in the results for 1957 in Tables 23, 24, 25 and 26.

TABLE 23:

RATES OF NITROGEN & ESPACEMENT OF MAIZE ON GREY BROWN SANDY LOAM.

Maize Grain in 200 lb. Bags per Acre.

Spacing	6"	12"	18"	24"	Mean
Treatments					
No Nitrogen	5.18	6.28	8.05	9.96	7.36
20 lbs. N.	7.86	11.00	10.42	10.27	10.27
40 lbs. N.	11.85	14.61	13.12	11.38	12.85
60 lbs. N.	15.42	18.06	16.87	14.12	16.10
Mean	10.07	12.48	12.46	11.58	11.65

S.E. plus/minus 0.48.

TABLE 24:

RATES OF NITROGEN AND ESPACEMENT OF MAIZE ON RED SANDY LOAM.

Maize Grain in 200 lb. Bags per Acre.

Spacing	6"	12"	18"	24"	Mean
Treatments					
No Nitrogen	6.26	6.79	5.71	4.76	5.88
20 lbs. N.	8.49	8.66	7.91	6.49	7.89
40 lbs. N.	10.31	9.38	7.40	6.56	8.41
60 lbs. N.	10.04	10.37	8.63	5.98	8.76
Mean	8.78	8.80	7.41	5.95	7.72

S.E. plus/minus 0.26.

TABLE 25:

SPACINGS, RATES AND TIME OF N. APPLICATION ON MAIZE. GREY SANDY LOAM.

Grain in 200 lb. Bags per Acre.

Treatment	N. applied 6 weeks after planting	½ N. at 6 weeks. ½ N. at Tasselling
No Nitrogen	7.02	7.73
20 lb. N.	10.42	10.17
40 lb. N.	12.95	12.81
60 lb. N.	16.10	16.18
6" Espacement	9.14	11.03
12" Espacement	13.27	11.73
18" Espacement	12.10	12.87
24" Espacement	11.97	11.24
Mean	11.62	11.72

S.E. plus/minus 0.34.

TABLE 26:

SPACINGS, RATES AND TIME OF APPLICATION OF N. ON MAIZE ON RED SANDY LOAM.

Grain in 200 lb. Bags per Acre.

Treatment	N. applied at 6 weeks after planting	½ N. at 6 weeks and ½ N. at Tasselling
No Nitrogen	5.49	6.28
20 lb. N.	7.78	8.00
40 lb. N.	8.57	8.25
60 lb. N.	9.25	8.69
6" Espacement	8.86	8.69
12" Espacement	9.08	8.52
18" Espacement	7.15	7.68
24" Espacement	5.99	5.91
Mean	7.77	7.70

S.E. plus/minus 0.18.

While there is no difference between T_1 and T_2 in Tables 25 and 26, the former is to be preferred as it involves only one operation. The application

of Nitrogen to maize at 6 weeks after planting was significantly better from 1955 onwards.

(b) **Forms of Nitrogen:**

In 1957 and 1958 a small trial was carried out to compare conjoint and separate applications of N and P, and two forms of Nitrogen.

Treatments were: No nitrogen — superphosphate only.

40lb. N. per acre mixed with supers and drilled at planting.

40lb. N. per acre side dressed six weeks after planting.

20lb. N. per acre mixed with supers and drilled at planting plus

20lb. N. per acre side dressed at six weeks. N. supplied as Sulphate of Ammonia versus N. supplied as Nitromoncal (Limestone Ammonium Nitrate).

Arrangement: Randomised blocks.

For results see Table 27.

TABLE 27.

FORMS OF NITROGEN AND METHODS OF APPLICATION.

Maize Grain in 200 lb. Bags per Acre.

Method of Application	Form of N.	Mean Yield 1957	Mean Yield 1958	Mean
No N. applied	—	8.10	6.23	7.17
Applied as Mixture With P at Planting	Sulph. Amm.	14.73	11.55	12.73
	Nitromoncal	14.27	10.32	
Half N as Mixture With P and half side-dressed	Sulph. Amm.	14.84	10.86	12.81
	Nitromoncal	14.34	11.40	
All N Side-dressed	Sulph. Amm.	13.69	12.56	13.40
	Nitromoncal	14.35	13.00	
	Mean Yield	13.47	10.84	
	S.E. Mean Yields ±	0.60	0.66	
	L.S.D. (5%)	1.72	1.93	
	Var. Ratio	16.08	11.35	
	F. Requirement	2.42	2.42	
	Coeff. of Var.	10.9%	14.9%	

These trials proved (i) that there is no difference between Sulphate of Ammonia or Nitromoncal as a form of N. thus justifying the decision to use only Nitromoncal on all experiments due to the low state of buffer of the lowland soils and (2) that a side dressing of N. at 6 weeks gives better results than applying N. as a mixture with P. at planting time, as is so frequently advocated in Southern Africa.

(c) **Forms of Nitrogen**

In 1959 and 1960 a similar trial was carried out comparing Nitromoncal and the high N. containing Urea that had recently been made available.

Arrangement: 3 randomised blocks of 12 plots each.

Treatments:

Nm.1 = 20lb. N. per acre as Nitromoncal
Nm.2 = 40lb. N. per acre as Nitromoncal
Nm.3 = 80lb. N. per acre as Nitromoncal
U.1 = 20lb. N. per acre as Urea.
U.2 = 40lb. N. per acre as Urea.
U.3 = 80lb. N. per acre as Urea.
S.1 = 3ft. x 12in. Spacing.
S.2 = 3ft. x 18in. Spacing.

ALL SIDE-DRESSED AT 6 WEEKS

Basal: 200lb. 19% Superphosphate and 15lb. zinc Sulphate per acre drilled at planting.

Results: See Table 28.

TABLE 28.

SPACINGS AND FORMS OF N. ON MAIZE (UREA vs. NITROMONCAL).

Grain in 200 lb. Bags per Acre.

Treatment	1959	1960	Mean
S_1 U3	13.23	13.40	13.34
S_2 U3	13.45	10.94	12.20
S_2 Nm.3	14.55	9.67	12.11
S_1 Nm.2	11.91	11.80	11.86
S_1 Nm.3	11.88	11.56	11.72
S_2 Nm.2	11.16	11.10	11.13
S_1 U2	10.61	11.40	11.00
S_2 U2	11.91	9.72	10.82
S_1 Nm.1	10.89	10.56	10.73
S_1 U1	10.32	10.16	10.24
S_2 Nm.1	10.53	9.94	10.23
S_2 U1	9.56	10.07	9.82
Mean	11.67	10.86	11.27
S.E. Mean Yields ±	0.72	0.64	
L.S.D. (5%)	2.05	1.82	
Coeff. of Variance	10.76%	10.27%	
Variance Ratio	4.10	2.83	
F. Requirement	2.26	2.26	

Discussion: While there is no significant difference between Urea and Nitromoncal it would appear after only 2 seasons' trials that Urea gives slightly better yields. Due to the lower cost per unit of N., and reduced railage costs due to the higher concentration of N. in Urea, it would be advisable to advocate the use of Urea instead of Nitramoncal.

(d) **Nitrogen and Monoculture**

In 1956 57 an experiment testing the possibility, that a high level of maize production can be maintained for a long period in a system of monoculture using no organic manures, was started. The essence of the theory is that, given sufficient carbohydrate in the form of crop residues, nitrogen supplied as fertilizer can be converted into a more stable and effective organic form. To make maximum use of this N. the plant population must be as high as soil moisture conditions permit. In the first season of the trial, stover equivalent to that produced locally from a 20 bags acre crop was applied to plots.

Treaments: (a) Whole plots—winter treatments.

O = No stover (all removed) and no nitrogen.

N_1 + S = 20lb. N. per acre plus plot stover ploughed in.

N_2 + S = 40lb. N. per acre plus plot stover ploughed in.

N_1 = 20lb. N. per acre ploughed in with no stover.

N_2 = 40lb. N. per acre ploughed in with no stover.

(b) Sub-plots—summer treatments.

O = No nitrogen.

N_1 = 20lb. N. per acre side-dressed at 6 weeks.

Arrangement: Randomised blocks with split plots.

Basal: 400lb. 1 : 1 Supers/Raw Phosphate mixture in winter.

Soil: Grey-brown-sandy-loam.

Results: See Table 29.

TABLE 29 (NITROGEN AND MONOCULTURE).

Maize Grain in 200 lb. Bags per Acre.

Winter Treatments	SUMMER SIDE DRESSING								MEANS				MEAN
	0				N.1								
	1957	1958	1959	1960	1957	1958	1959	1960	1957	1958	1959	1960	
0.	6.47	2.01	4.32	3.04	10.62	3.56	7.66	6.93	8.55	2.78	5.99	4.98	5.58
N1	15.09	5.33	9.74	7.77	16.72	6.38	11.88	9.16	15.90	5.85	10.81	8.46	10.26
N2	19.64	7.23	12.41	9.90	19.52	7.29	12.14	10.44	19.58	7.25	12.28	10.17	12.32
N1+S	12.77	4.63	8.67	8.32	14.90	5.75	9.41	8.48	13.84	5.19	9.04	8.99	9.27
N2+S	11.00	7.13	10.99	9.98	20.11	7.56	11.43	8.93	18.56	7.34	11.21	9.45	11.64
Mean	14.19	5.26	9.23	7.80	16.37	6.11	10.50	8.79	15.28	5.69	9.87	8.29	9.81

Discussion: From the start of the experiments there have been significant responses to Nitrogen treatments, with a significant effect from the top dressing of nitrogen, accompanied by significant interactions between treatments.

The responses to Winter and Summer Nitrogen application are not unexpected, but it is interesting to note that yields are depressed when the stover is incorporated in the Soil. It is possible that nitrogen applications are too low to ensure complete bacterial breakdown of the organic material.

(e) Nitrogen and Grass Leys:

In 1958 an experiment was started at Maseru to test the efficacy of the system of building up soil fertility by means of heavily fertilised grass leys.

Initially various rates of nitrogenous fertiliser were tested on Eragrostis curvula, all plots receiving the same basal superphosphate. After 3 years under grass the ley is to be ploughed in and planted to a test crop of maize.

Arrangement: Six randomised blocks.
Basal: 300lb. Superphosphate per acre.
Fertiliser: All N. supplied as Nitramoncal (20.5 per cent. N.).
Results and Treatments: See Table 30.

TABLE 30.

Nitrogen and Grass Leys.

Air Dry Hay in Tons per Acre.

TREATMENTS	MEAN YIELDS			MEAN
	1958	1959	1960	
No Nitrogen	0.70	0.69	0.55	0.65
30 lbs. N. per acre	1.10	1.30	1.43	1.28
60 „ N. „ „	1.50	1.82	1.88	1.73
90 „ N. „ „	1.77	2.31	2.60	2.23
120 „ N. „ „	2.60	2.84	3.13	2.86
150 „ N. „ „	2.64	3.21	3.61	3.15
Mean	1.72	2.03	2.20	1.98
S.E. Mean Yields ±	0.08	0.18	0.11	
L.S.D. (5%)	0.23	0.51	0.32	
Variance Ratio	101.00	23.86	106.79	
F. Requirement	2.60	2.60	2.60	
Coeff. of Variance	11.2%	21.70%	12.21%	

Discussion: The increased rates of N. are progressively significant as regards yield but it is doubtful whether they would prove to be economic. The final assessment of this experiment can only be made once the test crop has been harvested.

(f) Fertility Trials with Lime, Phosphates, Manures and Manure ash.

(1) Manure, Ash and Phosphates.

In 1955-56 a trial was started to compare the direct and residual effects of kraal manure, manure ash and phosphatic fertiliser. Considerable quantities of manure ash lie accumulating outside most dwellings in Basutoland, representing wasted fertility which could be beneficially used to increase production.

Arrangement: 5 randomised blocks of 10 plots each.

Treaments: Rates of manure, manure ash, and phosphatic fertiliser where:

O=No treatment.

D=Kraal Manure.

P=1:1 mixture of Rock and Super phosphate.

A=Manure Ash.

1=At a rate to give 25lb. P_2O_5 per acre.

2=At a rate to give 50lb. P_2O_5 per acre.

3=At a rate to give 75lb. P_2O_5 per acre.

Basal: First year residual superphosphate at 200lb. per acre.

Results: See Table 31.

TABLE 31.

Rates of Manure, Ash and Phosphates.

Grain Yields in 200 lb. Bags per Acre.

TREATMENT	FERTILIZERS APPLIED			RESIDUAL EFFECTS		5 YEAR AVE.
	MAIZE 1956	MAIZE 1957	MAIZE 1958	MAIZE 1959	BEANS 1960	
D.3	12.01	5.86	8.31	6.60	3.68	7.29
D.2.	11.47	5.16	7.78	5.97	3.59	6.79
A.3.	11.51	5.26	7.31	5.08	3.61	6.55
D.1.	10.62	5.08	6.97	5.96	3.18	6.36
A.2.	11.90	5.47	6.83	4.48	2.92	6.32
P.3.	11.89	4.93	5.47	6.42	2.67	6.28
P.2.	12.45	4.77	6.81	3.41	2.96	6.08
A.1.	10.39	4.68	6.50	3.97	3.10	5.73
P.1.	11.07	4.52	5.80	3.50	2.59	5.48
O.	9.14	4.35	5.71	3.59	2.89	5.14
Mean	11.25	5.01	6.75	4.90	3.12	6.20
S.E. Mean Yields ±	0.59	0.31	—	0.34	0.24	
L.S.D. (5%)	1.69	0.89	—	1.09	0.68	
Variance Ratio	2.76	2.18	2.67	10.13	2.69	
F. Requirement	2.15	2.15	2.84	2.10	2.10	
Coeff. of Var.	—	—	—	19.3%	18.84%	

Manure is significantly better than ash, and ash is significantly superior to phosphates. All treatments give increased yields.

(2) **Phosphates, Manure and Lime:**

In 1953/54 two experiments in a fundamental study on maize were laid out on two different soil types to:—

(a) Compare the effectiveness, on a total P_2O_5 basis of kraal manure and a phosphate fertiliser.

(b) Test the effect of lime on two very different soil types (different with regard to iron content in particular).

(c) Find out whether increased efficiency in phosphate utilisation would be brought about by liming.

One Experiment was planted at the sub-station at Machache in the foothills and one at Maseru. The foothill experiment continues, but the one at the main station was discontinued after 1959, as the site was required for expanding the agricultural school.

Arrangement: Two replicate, 3 x 3 x 3 factorial designs in 6 blocks of 9 plots each.

Treatments: Factorial combinations of 3 rates of total P_2O_5 applied as kraal manure (D0, D1, D2), 3 rates (the same) of total P_2O_5 applied as 1:1 Super/Raw Rock Phosphate fertiliser (P0, P1, P2), and 3 rates of high carbonate agricultural lime (L0, L1, L2) where:

D0=No kraal manure.

D1=Kraal manure to give 25lb. P_2O_5 per acre.

D2=Kraal manure to give 50lb. P_2O_5 per acre.

P0=No phosphatic fertiliser.

P1=25lb. P_2O_5 per acre as 1:1 mixture.

P2=50lb. P_2O_5 per acre as 1:1 mixture.

L0=No agricultural lime.

L1=1,000lb. agricultural lime per acre.

L2=2,000lb. agricultural lime per acre.

Soil Types: At Maseru, Residual grey-brown podsolic sandy loam derived from Sandstone (pH 5.2). At Machache: Residual red ferruginous loam derived from basalt pH 5.3 (lateritic red earth).

Results — see tables 32 and 33.

TABLE 32: MANURE, LIME AND PHOSPHATES:

Lowland Grey-Brown Sandy Loam.

Average for 6 Years.

Grain Yield in 200 lb. Bags per Acre.

		P. as Fertilizer			Lime			
		P0	P1	P2	L0	L1	L2	MEAN
P. as Manure	D0	6.37	7.15	6.80	6.05	7.20	7.06	6.77
	D1	7.57	7.90	7.78	7.54	7.94	7.85	7.78
	D2	8.86	8.65	8.80	8.69	8.83	8.80	8.77
Mean		7.60	7.90	7.79	7.42	7.99	7.90	

		Lime		
		L0	L1	L2
P. as fertilizer	P0	6.95	7.70	8.13
	P1	7.62	8.21	8.04
	P2	7.70	8.07	7.71

TABLE 33: MANURE, LIME AND PHOSPHATES.

Foothill Red Loam.

Average for 7 Years' Experiments.

Grain Yield in 200 lb. Bags per Acre.

P. as Manure	P. as Fertilizer			Lime			MEAN
	P0	P1	P2	L0	L1	L2	
D0	5.00	8.26	9.24	5.99	7.39	8.81	7.56
D1	6.96	8.85	10.18	6.93	9.06	9.83	8.05
D2	8.64	10.04	10.69	8.32	10.06	10.75	9.79
MEAN	6.87	9.05	10.04	7.08	8.84	9.81	

P. as Fertilizer	Lime		
	L0	L1	L2
P0	4.73	6.80	8.39
P1	6.88	8.74	9.36
P2	8.50	9.75	9.41

Discussion: On the foothill red loams there are significant responses to Manure, Phosphate and Lime both alone and in combination.

On the lightly buffered lowland grey soils there is a depression in yield when more than 1,000lb. lime per acre is applied. There were positive responses to Manure and Phosphates.

(3) **Manure, Lime and N.P.K.**

In 1953/54 an exploratory trial with maize was laid out in the Foothill zone of the Agricultural Pilot Project.

Arrangement: 2^5lb. factorial confounded to give 4 blocks of 8 plots each.

Treatments: D = Kraal Manure at 5 tons per acre.
L = Agricultural Lime at 1 ton per acre.
N = 20lb. N. per acre as Sulphate of Ammonia.
P = 50lb. P_2O_5 per acre as 1:1 mixture.
K = 30lb. K_20 per acre as Muriate of Potash.

Soil Type: Foothill red loam derived from Basalt.

Results: See Table 34.

TABLE 34: D, L, N.P.K.

Maize Grain in 200 lb. Bags per Acre.

Treatmen	Mean Response	RESPONSE WITH									
		N.		P.		K.		D.		L.	
		Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.
N.	0.57	—	—	+1.32	—0.18	+0.15	+1.00	+1.88	—0.73	+0.46	+0.69
P.	2.81	+3.56	+2.06	—	—	+3.35	+2.28	+2.75	+2.88	+2.72	+2.90
K.	1.43	+0.95	+1.85	+1.96	+0.89	—	—	+2.93	—0.80	+1.82	+1.04
D.	2.03	+3.34	+0.73	+1.96	+2.10	+3.54	+0.53	—	—	+1.41	+2.65
L.	2.13	+2.02	+2.25	+2.05	+2.23	+2.53	+1.75	+1.52	+2.76	—	—
S.E	±0.66	±0.93									

Mean Yield 5.25. Var. Ratio 3.78. F. Requirement 2.53.

Discussion: The responses to manure and phosphate occurred as usual. For this trial the manure used was not analysed and its relative efficiency cannot be accurately assessed.

The different response to potash in the presence and absence of manure and vice versa is not easily explained; neither is that of manure in relation to nitrogen, unless the manure contained large quantities of undecomposed carbohydrate. The large response to lime was similar to that on other foothill soils. Lime did not increase the effectiveness of the phosphate.

(4) **Manure and Fertilizer on Mountain Soil**

In 1953/54/55 a small trial was carried out at Mokhotlong to compare the effects of Manure and Fertilizer. It was the only Mountain Experiment having manure as a treatment.

Arrangement: 4 x 4 latin square.

Soil Type: Colluvial-alluvial black class.

Treatments and Results: See Table 35.

TABLE 35.

Maize Grain in 200 lb. Bags per Acre.

Treatments	Mean Yields	
	1954	1955
Control	6.16	7.51
50 lbs. P205/acre as Manure	6.14	7.72
20 lbs. N. 50 lbs. P205 and 30 lbs. K. as Mixture	6.02	6.88
Manure + Fertilizer mixture	6.11	6.99
Mean	6.11	6.99
S.E. Mean Yields ±	0.14	1.30
L.S.D. (5%)	—	—
Var. Ratio	Fraction	0.84

Discussion: The mountain soils are extremely fertile. There were no yield increases brought about by the addition of manures and fertilizers after two years. Had the experiment been continued responses to P. similar to those being obtained in the N.P.K. series might have resulted.

(5) **Manure and Fertilizers on Lowland Soils:**

During 1953 and 1954 two fertility trials were conducted prior to the 1st rotation experiment, mainly to test techniques. They were not of great practical interest and were superseded by the Rotation I experiment. Results are not presented. The only factor of interest from them was that responses to phosphate and manure were larger in the presence of the other; giving rise to the idea that the lack of organic matter in the lowland soils is a limiting factor in phosphate utilisation.

(6) **3 Site Long Term Rotation Experiment:**

One of the main shortcomings of the N.P.K. series and the Manure, Phosphate and Lime experiments is the lack of provision for measuring residual effects. Also no rotation of crops features in these experiments. A long term three course rotation (on three sites) was planned in 1954 to provide information on the question. Directly manured maize is followed by a bean crop to measure the first year residual effects; the beans in turn by wheat for

the second year residual effects. In the wheat comparison is also made with direct phosphate. First year residual effect of phosphate is therefore also measured on the subsequent maize phase, where it is compared with direct N.P.K. and Manure.

Arrangement: 25 two replicate factorial design in 8 blocks of 8 plots each, repeated on three sites, each site in any one year carrying one phase of a three course rotation of maize, beans and wheat.

Treatments: (Maize phases only). Factorial combinations of the presence and absence of N.P.K., D & P^1 where:—

N = 40lb. N. per acre as Nitromoncal.
P = 50lb. P_2O_5 as 1:1 Supers-Raw Phosphate mixture.
K = 30lb. K_2O per acre as Muriate of Potash.
D = 50lb. P_2O_5 as kraal manure.
Applied to wheat only.
P^1 = 50lb. P_2O_5 per acre as 1:1 mixture.
Results are given in Tables 36, 37 and 38.

TABLE 36 (DIRECT N.P.K. and D-1st RESIDUAL P 1).
Maize Grain in 200 lb. Bags per Acre.

Factor	Mean Responses						
	1954	1955	1956	1957	1958	1959	1960
N.	+0.05	+1.11	+3.37	+1.64	3.67	+1.84	+0.41
P.	+3.30	+2.33	—0.07	+1.41	—1.01	+1.33	—0.55
K.	—0.14	+0.21	—0.23	+0.28	—0.05	—0.11	+0.99
D.	+3.63	+0.94	+0.47	+2.58	+0.58	+3.13	0.69
P 1	—	—		+0.08	—0.40	+1.16	0.95
S.E. ±	0.90	1.05	0.55	0.29	0.30	0.20	0.35

TABLE 37 (FIRST RESIDUAL N, P K and D and 2nd RESIDUAL P 1).
Bean Grain in 200 lb. Bags per Acre.

Factor	Mean Responses					
	1955	1956	1957	1958	1959	1960
N.	Failed	+0.04	Destroyed by Hail	+0.27	—0.04	—0 29
P.		+0.25		—0.40	—0.16	+0.01
K.		—0.22		—0.17	—0.26	—0.42
D.		+0.15		—0.33	—0.33	+0 09
P 1		—		0.05	—0.02	—0.30
S.E. ±	—	—	—	0.19	0.11	0.44

TABLE 38 (2nd YR. RESIDUAL P., K. AND D., DIRECT N. AND P 1).
Wheat Grain in 200 lb. Bags per Acre.

Factor	Mean Responses				
	1956	1957	1958	1959	1960
N.	+0.28	No Significant Results	+1.32	—0.06	—0 09
P.	+0.50		+0.86	+0.11	+0.23
K.	—0.47		+0.97	+0.06	+0 08
D.	+0.23		+0.56	—0.03	—0.01
P 1	—0.46		+2.74	—0.08	+0.16
S.E. ±	0.10		0.26	0.05	0.13

Discussion: There are significant responses to direct phosphate and Manure in some years. This experiment must continue a lot longer before a true assessment can be made.

(7) **Comparison of Arable Rotations.**

In a second long term experiment started at Maseru in 1957 four different crop rotations and two systems of manuring and fertilisers are compared in 4 series. The series being planted in consecutive years. The results for the maize test crop of the first series are given in Table 39.

TABLE 39.

COMPARISON OF ARABLE ROTATIONS.

Maize Grain in 200 lb. Bags per Acre.

	A.	B.	C.	D.	Mean	S.E. ±
X.M.	12.05	11.77	12.46	13.86	12.54	±0.31
Y.M.	12.15	12.21	12.76	13.49	12.65	
Mean	12.10	11.99	12.61	13.68	12.59	
S.E.	plus/minus 0.54.					

S.E. vertical Comparisons = plus/minus 0.61.
S.E. horizontal Comparisons = plus/minus 0.69.

S.E. vertical Comparisons=plus/minus 0.61.
S.E. horizontal Comparisons=plus/minus 0.69.

Discussion: There is no significant difference between treatments. These will only become apparent after the trial has continued for a further period of years.

(8) **Tillage Experiments:**

The most widespread soil of the Basutoland lowlands is a grey brown or brown sandy loam (solodised solon, etc.) typified by a shallow topsoil with weak structure on a heavy yellow clay subsoil. These occur mainly in the Maseru district and southwards; the soils to the north, with increasing rainfall, tend more towards the podsol type. Mention has been made of the poor drainage properties of the soil in the section on liming. The base status of the topsoil is low while that of the subsoil is very high.

Through continuous cropping without manuring large areas of soil in the lowlands are completely impoverished and structureless. They readily become waterlogged in summer and blow in the winds of August and September. Hundreds of acres have been abandoned.

It was considered that deep ploughing, leading to the inversion of the top inches of the subsoil, might improve their physical properties and at the same time make more nutrients available nearer the surface; that a general revitalisation might occur.

A small trial was laid at Maseru.

Treatments were as in Table 40 for the first year, followed by 6 inch ploughing in subsequent years. Only the first year's results showed significance and are presented. The trial has now been concluded and a new tillage trial started.

Arrangement: Randomised Blocks.

TABLE 40 (TILLAGE TRIAL 1957).

Maize Grain in 200 lb. Bags per Acre.

Treatment	Mean Yield
6 ins. Ploughing	15.49
6 ins. Ploughing + Subsoiling	16.05
20 ins. Ploughing	16.23
20 ins. Ploughing plus gypsum	18.44
Mean	16.55
S.E. Mean Yields ±	0.09
L.S.D. (5%)	0.30
Variance Ratio	224.6
F. Requirement	4.76

Discussion: All treatments are significantly better than 6 inch ploughing, while the addition of gypsum to the 20 inch ploughing gave a significant and most interesting result. Arising from the gypsum originally being applied to counteract possible sodium brought up from the subsoil, subsequent experiments have established a sulphur deficiency in similar soils.

(9) **Winter grazing of arable land:**

A trial designed to measure and compare the effects of various methods of winter use of arable lands was started in 1955. The winter communal grazing of lands in Basutoland with heavy grazing intensities followed by the removal of all dung for domestic fuel, and usually all remnant maize stalks and weeds as well, was thought to have an important bearing on soil fertility.

It was only in 1958 that any differences in treatments became apparent. Results for 1958, 1959 and 1960 are given in Table 41.

Arrangement: 4 randomised blocks.

TABLE 41 (WINTER LAND USE).

Maize Grain in 200 lb. Bags per Acre.

Treatment		1958	1959	1960
(1) Grazed and remnant stover removed (not dung)		8.64	4.02	13.05
(2) No grazing, no removals		8.81	3.92	13.83
(3) Grazed—no removals		9.08	3.90	13.87
(4) Grazed—dung and stover removed		8.86	3.70	12.41
(5) Grazed—dung removed (not stover)		8.77	3.26	12.98
Grazing = 1500 large stock grazing hours per acre	Mean	8.83	3.77	13.23
	S.E. Mean Yield ±	—	0.16	0.47
	L.S.D. (5%)	—	0.44	1.32
	Coeff. of Variance	6.2%	8.30%	7.05%
	Variance Ratio	Fraction	3.84	3.26
	F. Requirement	—	3.26	1.77

Discussions: The experiment will have to run for some years longer before definite conclusions can be reached.

(10) **Espacements of Maize with N. and P.**

In the 1957/58 season five maize trials were planted in the districts at Leribe, Teyateyaneng, Matsieng, Machache and Mafeteng on sites of previous N.P.K. experiments. In the case of phosphates, therefore, the treatments include a substantial component of residual effect.

Arrangement: Single replicate 3 x 3 x 3 factorial designs.

Treatments: (Rates given per acre.)

N_0=No nitrogen.
N_1=20lb. N.
N_2=40lb. N.
P_0=No phosphate.
P_1=25lb. P_2O_5.
P_2=50lb. P_2O_5.
S_0=Plants 3ft. x 24in.
S_1=Plants 3ft. x 18in.
S_2=Plants 3ft. x 12in.

The S_2 espacement gives a population of approximately 14,800 plants per acre. N. is applied as Nitromoncal and P. as 1:1 mixture of superphosphate and raw moroccan rock phosphate.

Application: P. drilled at planting; N. applied at six weeks as a side dressing.

Results see Table 42.

TABLE 42

RATES OF P., RATES OF N. AND PLANT POPULATION.

Maize Grain in 200 lb. Bags per Acre.

STATION	SOIL	LINEAR RESPONSES											
		1958				1959				1960			
		N.	P.	S.	SE ±	N.	P.	S.	SE ±	N.	P.	S.	SE ±
LOWLANDS													
Leribe	RSL	** +5.84	** +3.87	* −2.12	0.81	** +6.12	** +2.52	** +2.45	0.61	** +2.88	** +4.53	−0.48	0.55
Teyateyaneng	BSL	** +6.10	** +5.84	−0.99	0.95	** +4.72	** +5.61	−0.79	0.69	** +5.79	** +6.56	−0.91	0.65
Matsieng	RSL	* +1.79	** +5.58	** +6.20	0.71	** +3.00	** +4.64	* +1.87	0.92	** +5.96	** +2.26	0.35	0.23
Mafeteng	G-BSL	+1.21	** +3.40	−0.64	0.94	** +3.67	** +3.56	** +1.86	0.59	** +1.70	** +2.32	** +2.80	0.52
FOOTHILLS													
Machache	RL	−0.52	** +9.03	** +7.50	0.68	* +1.89	** +9.62	** 3.64	0.84	* +2.06	** +5.37	* +2.14	0.80

* = Significant at P = 0.05. ** = Significant at P = 0.01.

RSL = Red Sandy Loam. G-BSL = Grey Brown Sandy Loam.

RL = Foothills Red Loam. BSL = Light Brown Sandy Loam.

Discussion: While only linear responses are given, there were general significant interactions between nitrogen and phosphate and some nitrogen and phosphates with spacing. The experiments must continue awhile before final decisions can be made, but it can safely be said that phosphates, plus nitrogen plus a high plant population gives the highest yields of Maize.

(5) TRACE ELEMENT STUDIES:

Trace element trials were started in 1953/54 on a small scale and over the years the programme has been intensified. Initial trials showed few responses and it is only recently; with the application of better techniques, designs and knowledge that positive results are being obtained.

(a) Initial Exploratory Trials.

Trials were started at Maseru and Mokhotlong in 1953/54 comparing Cu, Zn, Mg, Mn and B. on maize and wheat. The treatments embodied the spray versus the dry application of salts, but after 3 years' experimentation, during which some trials failed due to climatic conditions and insect damage no significant responses were obtained, either from direct application or residuals.

(b) Minor elements on Foothill Red Loam.

In the 1956/57 season a trace element experiment was started at Machache embodying the following treatments per acre:—

Cu.=10lb. Copper Sulphate.
Zn.=10lb. Zinc Sulphate.
Mg.=50lb. Magnesium Sulphate.
Mn.=15lb. Manganese Sulphate.
B/Mo.=10lb. Borax plus 4oz. Molybdenum trioxide.

A very heavy basal dressing was given consisting of 400lb. Supers plus 100lb. Muriate plus 200lb. Nitramoncal per acre. Salts were mixed with the basal and disced in. Later on in the experiment, when it was established the Boron was not beneficial but Molybdenum was. Boron was withdrawn from the mixture. For results see Table 43.

TABLE 43.

TRACE ELEMENTS ON FOOTHILL RED LOAM.

Grain Yields in 200 lb. Bags per Acre.

FACTOR	MEAN RESPONSES			
	1957 Maize	1958 Maize	1959 Beans	1960 Maize
Copper	—0.2	—0.32	+0.08	—0.32
Molybdenum	+1.42	+1.03	—0.06	+1.78
Zinc	+1.42	—1.17	—0.02	—0.24
Magnesium	+0.07	+0.43	+0.04	+0.55
Manganese	+1.17	+0.70	—0.04	—0.43
S.E. ±	0.31	0.77	0.15	0.44

Discussion: There is a response to Molybdenum and Magnesium.

(c) Minor Elements on Lowland Soils:

Experiments were started at Maseru and Leribe in 1956/57 having the following treatments per acre:

Cu.=10lb. Copper Sulphate.
Zn.=15lb. Zinc Sulphate.
Mg.=50lb. Magnesium Sulphate.
Mo.=4oz. Sodium Molybdate.
Mn.=15lb. Manganese Sulphate.
B.=10lb. Borax.

Arrangements: 26 half replicate factorial designs in 4 blocks of 8 plots each.

For results see Tables 44, 45, 46, 47.

TABLE 44.
TRACE ELEMENTS ON RED SANDY LOAM.
Grain Yield in 200 lb. Bags per Acre.

FACTOR	MEAN RESPONSES		
	1958 Beans	1959 Beans	1960 Maize
Copper	+0.98	—0.16	—0.22
Zinc	—1.49	+0.02	—0.16
Magnesium	—0.58	+0.32	—0.27
Manganese	—0.21	—0.05	+0.24
Boron	—0.79	+0.12	—0.54
Molybdenum	+1.25	+1.45	+0.05
S.E. ±	0.23	0.26	0.10

Discussion: There is a significant response to Molybdenum.

TABLE 45: TRACE ELEMENTS ON GREY BROWN SANDY LOAM.
Grain Yield in 200 lb. Bags per Acre.

FACTOR	MEAN RESPONSES		
	1958 Peas	1959	1960 Maize
Copper	+0.13		+0.10
Zinc	—0.42		+0.10
Magnesium	+0.53	Crop	—0.15
Manganese	+0.41	failed	+0.34
Boron	+0.40		—0.46
Molybdenum	+0.24		+0.78
S.E. ±			0.31

Discussion: Results are not significant.

TABLE 46.
TRACE ELEMENTS ON BROWN SANDY LOAM
Dry Beans in 200 lb. Bags per Acre.

FACTOR	Mean Response
Copper	+0.05
Zinc	+0.19
Magnesium	+0.24
Manganese	—0.08
Molybdenum	+1.61
S.E. ±	0.42

Discussion: This gives further confirmation to a Molybdenum deficiency in lowland soils.

TABLE 47.

TRACE ELEMENTS ON GREY-BROWN SANDY LOAM (1960).

Maize Grain in 200 lb. Bags per Acre.

Factor	Mean Response
Copper	+0.89
Zinc	—0.40
Magnesium	+0.99
Manganese	—0.59
Boron	+3.65
S.E. ±	0.65

Discussion: There was a significant response to Boron which is surprising.

(d) **Trace Elements with Lime and Phosphates.**

Large responses to liming on the Foothill red Loam had been recorded as well as responses to Molybdem. The possibility existed that the effect of liming was in part due to the rendering available of a micro-nutrient. A test was started in 1957/58.

TABLE 48. TRACE ELEMENTS WITH LIME AND P.

FOOTHILL RED LOAM.

Grain Yield in 200 lb. Bags per Acre.

FACTOR	O.			LIME			PHOSPHATE			Mean
	1958 Peas	1959 Maize	1960 Maize	1958 Peas	1959 Maize	1960 Maize	1958 Peas	1959 Maize	1960 Maize	
O.	1.13	3.31	4.57	1.82	9.40	11.51	2.30	5.42	13.92	5.99
B.	1.51	3.24	5.64	1.84	10.88	12.64	2.50	6.16	14.60	6.56
Zn—Mg	1.60	3.26	4.77	1.67	9.96	10.52	2.63	7.65	13.72	6.19
Mixture	1.58	5.28	8.91	1.53	7.91	10.66	2.32	7.83	13.61	6.51
Mn	1.82	3.12	6.41	1.75	10.61	10.12	2.12	6.37	13.22	6.17
Mo	1.42	3.93	5.96	2.18	11.16	11.58	2.12	8.66	14.35	6.82
Mean	1.63	3.69	6.04	1.80	9.96	11.17	2.33	7.02	13.83	6.38

Treatments: Per acre are:—

O.=No addition.

L.=Lime 3 tons.

P.=Superphosphate (300lb.).

B.=Borax, 10lb.

Mo.=Molybdenum Trioxide 4oz.

Mn.=Manganese Sulphate 15lb.

ZnMg.=15lb. Zinc Sulphate plus 50lb. Magnesium Sulphate.

Mix.=Mixture of B plus Mo. plus Mn.

Discussion: The main treatments are all significant, while in some years Molybdenum is significant on its own and in combination.

(e) **Rates and Forms of Molybdenum With Lime and Phosphates.**

In 1958/59 three trials. arising out of confirmed responses to Molybdenum and possible responses to Sulphur from the Tillage experiments were initiated to compare types and rates of Molybdenum and sulphur in conjunction with Lime and Phosphates.

Soils: Maseru — Grey Brown Sandy Loam. Red Sandy Loam.
Machache — Foothill Red Loam.

Arrangement: 3 replicate single factorial design of 4 plots of lime and phosphate, each plot sub-divided in 8 sub-plots of 3 rates of Molybdenum Trioxide, 3 rates of Ammonium Molybdate, 1 rate of Sulphur and control.

Discussion: As results show no significance between sub-treatments and only the usual phosphate and lime responses and interactions results are not presented.

(f) **Phosphates with Molybdenum and Sulphur.**

In 1958/59 five trials at Leribe. Teyateyaneng, Matsieng, Machache and Mafeteng were planted on old Maize N.P.K. sites to confirm indications of responses to sulphur and molybdenum.

Arrangement: 3^3 Single factorial designs in 3 blocks.

Treatments: 3 Rates of sulphur (S_0, S_1, S_2), 3 rates of phosphates (P_0, P_1, P_2) and 3 rates of molybdenum (Mo_0, Mo_1, Mo_2) where:—

S_1=150lb. Gypsum per acre.
S_2=300lb. Gypsum per acre.
P_1=20lb. P_2O_5 per acre.
P_2=40lb. P_2O_5 per acre.
Mo1=4oz. Molybdenum Trioxide per acre.
Mo2=8oz. Molybdenum Trioxide per acre.

Crop: Beans. Results: See Table 49.

TABLE 49: SULPHUR, PHOSPHATE AND MOLYBDENUM.

Bean Grain Yield in 200 lb. Bags per Acre.

STATION	LINEAR RESPONSES							
	1959				1960			
	S.	P.	Mo.	SE±	S.	P.	Mo.	SE±
LOWLANDS:								
Leribe	0.27	** 1.41	0.01	0.23	FAILED — HAIL			
Teyateyaneng	* 0.93	** 2.71	** 0.79	0.39	0.13	** 0.65	** 2.04	0.17
Matsieng	* 0.62	** 3.04	0.09	0.24	0.05	** 0.57	0.14	0.11
Mafeteng	0.32	** 2.32	** 1.04	0.27	0.02	—0.02	0.10	0.08
FOOTHILLS:								
Machache	0.32	** 2.22	0.10	0.34	—0.20	** 1.83	0.05	0.24

* = Significant at P = 0.05.
** = Significant at P = 0.01.

Discussion: These trials are too new to be able to draw final conclusion. The expected responses to Mo. and P. occur as well as a possible response to sulphur.

(g) **Nitrogen, Phosphates and Sulphur.**

In 1958 five experiments were laid down at district sub-stations on old wheat N.P.K. sites. The sulphur was Gypsum being applied to K plots from which no responses had been obtained in the past.

Arrangement: 3² single replicate factorial designs in 3 blocks.

Treatments:
N_0=No N.
N_1=10lb. N. per acre as Nitromoncal.
N_2=20lb. N. per acre as Nitromoncal.
P_0=No phosphate.
P_1=20lb. P_2O_5 per acre as 1:1 mixture.
P_2=40lb. P_2O_5 per acre as 1:1 mixture.
S_0=No Gypsum.
S_1=150lb. Gypsum per acre.
S_2=300lb. Gypsum per acre.
(Gypsum broadcast and Phosphate drilled below seed).

Crop: Maize.

Results: N. & P. gave the expected responses but there have been no responses from Sulphur applications and results are not presented.

(h) **Sulphur and Molybdenum on Lucerne — Maseru.**

In an effort to establish the effect of Sulphur and Molybdenum on lucerne a trial was started in 1958/59 on established lucerne at the Main Station at Maseru.

For treatments and results to date see Table 50.

TABLE 50.

(SULPHUR AND MOLYBDENUM ON LUCERNE.)

MASERU — SANDY ALLUVIAL SOIL.

Airdry-Hay in Tons per Acre.

Treatments	Mean Yield	
	1959	1960
0 = No fertilizer	4.87	4.67
P = 200 lbs. Superphosphate	4.83	4.44
P — S1 = 200 lbs. Supers — 150 lbs. Gypsum	4.75	4.54
P — S2 = 200 lbs. Supers — 300 lbs. Gypsum	4.68	4.57
P — Mo1 = 200 lbs. Supers — 4 ozs. Ammon. Molybdate	4.81	4.24
P — Mo2 = 200 lbs. Supers — 8 ozs. Ammon. Molybdate	4.96	4.54
Mean	4.85	
S.E. Mean Yields ±	0.10	
L.S.D. (5%)	0.28	
Coeff. of Variation	4.31%	
Variance Ratio	0.41	
F. Requirement	3.33	

Discussion: There are no significant responses.

(i) **Rates of Phosphate, Molybdenum and Sulphur on Beans.**

In 1958/59 a small trial was laid down on Beans at Mafeteng to compare 3 rates of Phosphate, 3 rates of Molybdenum and 3 rates of Sulphur on Grey Brown Sandy Loam.

Arrangement: 3 x 3 x 3 single replicate factorial design in 3 blocks of 9 plots each.

Treatments:

P_0=No phosphate.
P_1=200lb. Supers per acre.
P_2=400lb. Supers per acre
Mo_0=No Molybdenum.
Mo_1=4oz. Molybdenum Trioxide per acre.
Mo_2=8oz. Molybdenum Trioxide per acre.
S_0=No Gypsum.
S_1=150lb. Gypsum per acre.
S_2=300lb. Gypsum per acre.

Results: In 1959 the only response was to phosphates. For 1960 results see Table 51.

TABLE 51 (PHOSPHATE, MOLYBDENUM AND SULPHUR).

Bean Grain Yield in 200 lb. Bags per Acre.

	Linear Responses	Curvatures	Linear Interactions	
S.	—1.23 *	+0.12	S1 P1	—2.08 *
P.	+2.45 **	—4.73 **	S1 Mo1	+0.40
Mo	+0.38	+1.37	P1 Mo1	—0.58
S.E. ±	0.57	0.98	S.E. ±	—0.70

* = Significant at P = 0.05.
** = Significant at P = 0.01.

Discussion: There were again significant responses to Phosphates with a slight increase due to Molybdenum and a depression from Sulphur.

(6) OTHER INVESTIGATIONS:

Other investigations undertaken at the Station during the period under review were:—

(a) **Weedkiller Experiments:**

Most maize grown in Basutoland is hand cultivated, with or without additional implement cultivations. In order to compare the efficiency of a selective weedkiller and hand and implement cultivations in increasing maize yields and experiments on the question was started in 1954 and concluded in 1957 at Maseru.

Arrangement: Randomised Blocks.
Treatments: O=No weed control.
Postspray=Post-emergent spray of 2-4 D at 1 pint per acre.
Pre-spray=Pre-emergent spray of 2-4 D at 2 pints per acre.

Post Spray plus I.C.=Post spray as above plus one implement cultivation.

2.C.=Two implement cultivations.

3.C.=Three implement cultivations.

H.C.=Clean hand cultivation.

H.C. plus I.C.=One hand cultivation plus one implement cultivation.

(Prespray 5 days after planting; postpray maize 4—6 inches tall. 2 Pints amine salt contain 1lb. acid equivalent.)

Basal: 200lb. Superphosphate per acre.

Results: See Table 52.

TABLE 52: WEED CONTROL IN MAIZE.

Maize Grain in 200 lb. Bags per Acre.

Treatments	Mean Yields				4 Years Average
	1954	1955	1956	1957	
H.C. + I.C.	—	7.27	16.04	6.61	9.97
H. Clean	11.97	7.25	12.94	7.05	9.80
Postspray + I.C.	7.18	5.69	17.52	3.61	8.50
3.C.	7.20	6.05	14.39	3.62	7.82
2.C.	8 40	5.82	13.57	3.30	7.80
Prespray + I.C.	8.25	3.66	16.08	2.57	7.64
Prespray	5.40	2.98	9.33	1.04	4.69
Postspray	3.62	2.31	8.30	2.12	4.09
0.	1.82	1.37	2.40	0.53	1.53
Mean	—	4.71	12.06	3.38	6.87
S.E. Mean Yields ±	0.56	0.49	0.68	0.52	
L.S.D. (5%)	1.63	1.40	1.93	1.48	
Var. Ratio	31.10	19.40	20.54	18.43	
F. Requirement	2.36	2.18	2.18	2.18	

Discussion: All treatments were significantly better than control. The benefits of clean hand cultivation are clearly demonstrated.

(b) **Salk-borer Control in Maize.**

The Maize Stalk borer (Busseola Pusca) caterpillar . . causes severe damage to maize and sorghum crops every year in Basutoland. An experiment was carried out in 1959 on farm lands to ascertain the effectiveness of different insecticides and methods of application. Dusts were not included in the experiment as it was already established that liquid applications were preferable to dusting. Granular forms of inseticide could not be obtained in time to be included in the experiemnt. Aerial applications were by Piper aircraft delivering 5.5 gallons per acre. Insecticides were applied at a cost rate, using Endrin emulsion at ½ pint per acre as a standard.

Results: See Table 53.

TABLE 53 (STALKBORER CONTROL).

Percentage Larvae Alive.

Treatment	Infestation		
	Before Treatment	After 3 days	After 26 days
Endrin Emulsion Ground Application	82	18	0
D.D.T. Emulsion Ground Application	83	2	4
Endrin Emulsion Aerial Application	81	6	18
Systox Aerial Application	79	28	24
D.D.T. Emulsion Aerial Application	84	26	36

Discussion: It is apparent that ground application is superior to aerial application.

Both Endrin and D.D.T. gave good results.

(c)**Fortified Maize Meal.**

During the summer of 1958/59 it was found that many farm labourers were suffering from Pellagra, resulting from deficiencies in their diet and after consultation with the W.H.O. Nutritional Team then in Basutoland, it was decided to do a combined experiment with them, whereby labourers received a fortified Maize Meal manufactured at Marquard in the Orange Free State instead of their normal rations of white maize meal daily with supplementary meals of beans.

Results: (1) After 3 weeks' feeding all cases of pellagra were clinically cured.

(2) There was a general gain in weight of all labourers after one month's feeding. (See Table 54).

(3) The average consumption per meal dropped from 11.07oz. to 10.14oz.

(4) Output of work and willingness of the labourers improved markedly.

TABLE 54: FORTIFIED MAIZE MEAL.

Gains in Weight after 30 Days' Feeding.

Sex	No.	First Weight Mean		2nd Weight Mean		Weight gained per Head	
		lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
Male	26	128	15	130	8	1	9
Female	16	114	8	117	2	2	10

Discussion: On continuation of the trial it was found that the labourers became dissatisfied with a continuous diet of fortified meal; so it was decided to issue white maize meal 3 days a week and the fortified meal 4 days a week. No cases of pellagra resulted from this change.

(d) **Machobane Farming System:**

Two trials, one at Roma, comparing this system of inter-cropping with accepted methods of cropping were started in 1958/59. After one year's results it can be said that while there is no significant difference in overall yield from crops, the conventional system definitely has lower cost of production per acre, requires less men per hour and makes agronomic and insect control measures easier to apply. For practical reason this system cannot be recommended.

(7) **THE GREENHOUSE:**

This is used primarily for exploratory trials on various soils from the territory. Any promising results or responses are then incorporated in field trials.

Since its inception the greenhouse has been used for

(1) Sub-tractive trials using trace elements.

(2) Comparative trials on Rates and forms of Molybdenum and Sulphur.

(3) Comparative trials on Phosphatic fertilisers.

(4) Investigational trial into kimberlite deposits.

(5) Pilot investigations into crop response to iodine.

During 1960 47 trials were completed in the greenhouse. Most dealt with crop responses to iodine and the remainder were phosphate comparative trials.

(a) **Crop responses to Iodine.**

All the original trials conducted in 1959 were repeated in 1960 for confirmation of results. It now appears as if 1 and 2 p.p.m. Iodine as Potassium iodide give growth responses with wheat, peas and tomatoes; it depresses yields from beans, and the maize responses to its application are very variable. Further work is indicated. Field trials have been started.

(b) **Rock Phosphate Investigations:**

In comparative trials on wheat and peas the two new types of Rock Phosphate i.e. Novo and Reno, that are currently on the market were compared with existing types. They are not superior and give comparable responses in the greenhouse.

(8) **SUMMARY AND CONCLUSION:**

(a) **Summary:**

Since its inception to date the Experiment Station has been able to establish:—

(1) A general Phosphate deficiency in all soils in the territory. This is particularly marked in the foothills and the lowland. The mountain soils are extremely fertile and only suffer from a Phosphate shortage after a few years of cropping.

(2) A response to nitrogen applied to maize 6 weeks after planting, provided the maize crop has a high plant population.

(3) That Basutoland soils are not lacking in Potash.

(4) A response to lime on foothill soils, and red sandy lowland soils. The grey lowland soils do not respond to liming.

(5) That over 1,000lb. per acre of lime induces an iron deficiency on the lightly buffered grey lowland soils which persists for up to five years.

(6) That manures and manure ash increases yields on all soils except the Black Mountain soils.

(7) That there is some evidence of a sulphur deficiency on some soils.

(8) Definite responses to Molybdenum on certain soils.

(9) Iodine responses on some soils by some crops.

(10) One case of a magnesium deficiency.

(11) That the feeding of fortified maize meal cures pellagra.

(12) The best varieties of maize, wheat, beans, peas and sunflowers to grow in the territory.

(b) **Conclusions:**

The average maize production in the territory is 2.5 bags of maize per acre. With the use of phosphates, whether as ash, manure or superphosphate plus nitrogenous fertilizers this figure can be increased to 10 bags per acre thus quadrupling the maize production of the territory. This would give Basutoland a maize surplus instead of the present deficit. This surplus should be fed to livestock in the territory rather than exported due to the prevailing over-production of maize in the world's markets. Other crop yields can also be increased considerably with the use of phosphates.

To achieve this it is estimated that Basutoland would eventually require 30,000 tons of superphosphate and 10,000 tons of nitrogenous fertilizer per annum. The present road system in the territory is hopelessly inadequate to handle such large quantities of fertilizer and the resultant grain crops, and every effort must be made to improve communications in the territory.

ACKNOWLEDGEMENTS:

The writer wishes to acknowledge the assistance of the following firms, who have assisted the station during its life with goods, advice, seeds, etc.:

(1) Messrs Kynoch Ltd., Johannesburg.
(2) Messrs Fisons Ltd., Johannesburg.
(3) Messrs Windmill Fertilizers, Durban.
(4) Messrs Basutair, Maseru.
(5) Messrs Arthur Collins, Pietermaritzburg.
(6) Messrs Flora Dried Milk Co., Marquard.
(7) Messrs Shell Chemical Co., Johannesburg.
(8) Potchefstroom Research Station.
(9) Bethlehem Research Station.
(10) Division of Chemical Services, Pretoria.
(11) Department of Forestry, Pretoria.
(12) Messrs Grain & Seeds, Bethlehem.

and

to place on record his appreciation to all staff members, past and present, for their hard work, assistance and co-operation during the years, that they have been associated with the Station; and finally to thank his fellow officers in other sections of the Department for their ever-ready assistance and co-operation.

MEAN MONTHLY RAINFALL

(Nine Stations, at District Headquarters)

1959	Inches	Average for 10 years	Deviation
September	0.32	0.87	—0.55
October	2.47	2.40	+0.07
November	4.06	3.60	+0.46
December	6.02	4.82	+1.20
1960	**Inches**	**Average for 11 years**	**Deviation**
January	4.44	4.59	—0.15
February	4.73	5.25	—0.52
March	4.48	3.49	+0.99
April	3.09	2.53	+0.56
May	0.81	1.43	—0.62
June	0.40	0.36	+0.04
July	0.35	0.49	—0.14
August	1.35	0.40	+0.95
September	1.39	0.92	+0.47
October	3.09	2.46	+0.63
November	4.28	3.66	+0.62
December	4.65	4.80	—0.15
Yearly Total	33.06	30.38	+2.68

Annual Average for 44 years = 29.40 inches.

Territorial °C. Average Air Temperature, 1960.

Absolute Extremes				Means of		
Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	B Min.	A Max.	Means of A and B
37.1	—12.2	—0.8	28.2	8.1	20.7	14.4

APPENDIX I (CONTINUED)

Territorial Average—Dry and Wet-Bulb Thermometer Readings—Relative Humidity (14.00 hrs. S.A.T.) 1960

Reading	Jan.	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.
Dry Bulb	23.7	23.9	21.0	17.5	15.9	14.3	13.5	18.6	21.6	22.3	21.4	24.3
Wet Bulb	15.5	16.6	14.8	11.3	9.6	8.5	7.5	10.7	11.9	13.6	14.1	15.3
Relative Humidity	40.8%	47.3%	51.7%	46.8%	42.6%	44.1%	41.3%	35.8%	28.5%	36.3%	44.2%	37%

APPENDIX II

Livestock Industry Statistics

	CATTLE	HORSES	MULES	DONKEYS	SHEEP	GOATS	TOTALS
Census 1949	430,998	98,832	2,468	48,905	1,557,546	609,267	2,748,016
1951	401,221	102,903	3,089	59,188	1,564,001	637,065	2,767,467
1953	406,454	92,884	3,550	53,543	1,303,325	550,612	2,410,368
1955	408,144	102,001	4,829	48,855	1,339,079	654,800	2,557,648
1957	381,770	81,661	3,599	48,616	1,220,769	535,286	2,271,701
1958	362,897	81,115	3,753	49,098	1,231,699	505,562	2,234,123
1959	387,769	89,874	4,220	55,813	1,300,657	594,395	2,432,728
1960	331,203	83,910	5,022	48,564	1,037,372	579,166	2,085,237
Exports	10,379	34	—	—	2,883	268	
Imports	19,527	4,577	75	190	4,324	309	
Wool Exports (lbs.)	—	—	—	—	6,786,356	—	
Mohair Exports (lbs.)	—	—	—	—	—	1,180,670	
Bones Exported (lbs.)	578,492	—	—	—	—	—	
Hides Exported (units)	30,129	—	—	—	—	—	
Skins Exported (units)	—	—	—	—	67,612		

APPENDIX III

Importation of Maize from the Union of South Africa

(Bags of 200-lb. Nett.)

Season	1950/51	1951/52	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	11yr.av.
May	4,559	4,263	2,027	3,361	5,083	16,728	9,961	3,854	7,732	13,744	9,985	7,392
June	1,797	7,179	525	1,378	2,204	7,272	6,993	4,345	3,375	4,752	6,044	4,169
July	803	7,386	3,159	1,172	1,834	8,866	1,521	3,842	6,842	6,404	4,022	4,168
August	244	14,259	6,210	6,765	4,405	15,819	3,895	3,966	2,253	6,923	8,324	6,642
September	159	14,262	6,239	644	2,582	26,250	1,593	2,633	2,937	14,309	8,115	7,248
October	177	19,395	9,909	2,002	6,265	33,340	4,137	4,600	7,631	23,832	15,303	11,508
November	8,102	38,292	12,453	1,506	2,514	40,416	4,580	7,202	6,736	23,706	13,534	14,458
December	10,373	37,236	15,827	768	4,703	36,038	7,743	9,738	12,484	33,290	18,960	17,015
January	8,957	41,479	8,960	1,676	6,220	25,608	14,687	17,201	17,075	37,397	—	17,946
February	5,410	25,499	6,079	6,691	5,407	2,915	7,173	19,268	26,097	26,916	—	13,146
March	6,969	16,955	6,281	7,182	7,641	24,285	18,732	13,593	20,454	26,743	—	14,884
April	8,582	12,186	2,276	6,418	15,387	12,411	9,888	7,847	22,161	13,285	—	11,044
Total	56,132	23,391	79,945	39,783	64,245	249,948	90,903	98,089	135,777	231,301	—	129,620

APPENDIX III (CONTD.)

Crop Marketing Statistics — by Licensed Traders (In 200 lb. Bags)

Basutoland	Maize and Mealie Meal				Wheat				Sorghum			
Month	Stock begin month	Amount bought	Amount sold	Stock end month	Stock begin month	Amount bought	Amount sold	Stock end month	Stock begin month	Amount bought	Amount sold	Stock end month
January	21,168	13,934	18,111	16,991	1,032	2,658	1,301	2,389	12,413	2,548	4,746	10,215
February	16,432	9,647	13,708	12,373	2,554	6,664	3,932	5,286	9,385	2,106	4,966	6,525
March	11,683	5,803	9,668	7,818	6,741	7,250	6,497	7,494	5,568	3,889	5,085	4,372
April	7,663	4,445	7,012	5,096	8,646	8,017	3,377	13,286	3,007	564	2,544	1,027
May	4,343	3,554	4,076	3,821	14,042	8,108	4,686	17,464	954	2,195	1,013	2,136
June	4,738	6,963	1,935	9,766	16,924	5,778	5,648	17,054	2,683	10,841	1,200	12,324
July	10,246	24,930	3,161	32,015	17,055	2,199	4,383	14,871	12,291	7,546	2,169	17,668
August	28,446	18,497	5,320	41,623	14,704	1,111	3,993	11,822	16,729	6,077	4,254	18,552
September	40,957	7,786	6,076	42,667	10,038	368	1,992	8,414	16,829	1,551	2,049	16,331
October	42,087	5,035	7,451	39,671	8,435	219	2,233	6,421	16,183	1,122	2,328	14,977
November	37,918	3,825	11,177	30,566	6,387	176	2,052	4,511	14,832	1,034	2,816	13,050
December	32,142	7,499	14,806	24,835	4,537	981	1,227	4,291	14,055	1,303	3,209	12,149
Total Amount	—	111,918	102,501	—	—	43,529	41,321	—	—	40,776	36,379	—

Source: Agricultural Department.

APPENDIX IV

STAFF

In the list which follows are given dispositions of staff as at 31 December, 1960:

MASERU

D. D. Campbell, M.C.	Director of Livestock and Agricultural Services.
P. H. Brown	Principal Veterinary Officer.
J. H. Rhodes	Principal Agricultural Officer.
S. H. Youthed	Soil Conservation Officer.
E. J. V. Wiggill	Wool and Mohair Officer.
D. C. L. Wacher	Veterinary Officer.
C. M. H. Morojele	Statistician.
A. C. Macintosh	Agricultural Officer.
C. J. Mills	Agricultural Officer.
J. Presswood	Agricultural Officer.
J. R. L. Kotsokoane	Agricultural Education Officer.
I. L. Chard	Senior Agricultural and Livestock Officer.
A. Bisschoff	Senior Agricultural and Livestock Officer.
A. H. Gibson	Senior Agricultural and Livestock Officer.
G. Nchee	Forestry Officer.
V. Curle	Assistant Executive Officer.
F. Makhooane	Assistant Executive Officer.
T. Sekhesa	Assistant Executive Officer.
Mrs. J. Heard	Senior Lady Clerk.
Mrs. C. E. Carton	Lady Clerk/Typist.
S. Letsie, B.E.M.	Agricultural and Livestock Officer.
N. J. Molapo	Administrative Assistant.
T. Motsamai	Senior Veterinary Assistant.
J. M. Nthongoa	Teacher/Boarding Master.
L. A. Makoa	Teacher.
S. V. Mtombeni	Teacher.
E. M. Chobokoane	Teacher.

1 Senior Conservation Foreman.
2 Soil Conservation Foremen.
2 Soil Conservation Assistants.
1 Soil Conservation Mechanic.
1 Soil Conservation Clerk/Storeman.
14 Demonstrators.
2 Veterinary Assistants.
21 Assistant Demonstrators.
11 Clerks.
29 Temporary Assistant Demonstrators.

MAFETENG

D. Lekena, B.E.M. — Agricultural and Livestock Officer.
1 Veterinary Assistant.
2 Demonstrators.
11 Assistant Demonstrators.
1 Clerk.
1 Temporary Assistant Demonstrator.

MOHALE'S HOEK

P. Millin — Agricultural and Livestock Officer.
S. A. Townsend — Assistant Soil Conservation Officer.
1 Soil Conservation Assistant.
1 Veterinary Assistant.
4 Demonstrators.
9 Assistant Demonstrators.
1 Clerk.
14 Temporary Assistant Demonstrators.

QUTHING

J. J. Axentowicz — Agricultural and Livestock Officer.
3 Veterinary Assistants.
5 Demonstrators.
7 Assistant Demonstrators.
1 Clerk.
17 Temporary Assistant Demonstrators.

QACHA'S NEK

S. Lethunya — Acting Agricultural and Livestock Officer.
1 Veterinary Assistant.
4 Demonstrators.
7 Assistant Demonstrators.
1 Clerk.
17 Temporary Assistant Demonstrators.

MOKHOTLONG

G. Mochochoko — Agricultural and Livestock Officer.
1 Veterinary Assistant.
2 Demonstrators.
10 Assistant Demonstrators.
1 Clerk.
10 Temporary Assistant Demonstrators.

BUTHA BUTHE

A. Mathule, B.E.M. — Agricultural and Livestock Officer.
1 Veterinary Assistant.
3 Demonstrators.
6 Assistant Demonstrators.
1 Clerk.
10 Temporary Assistant Demonstrators.

LERIBE

E. A. Lesoli — Agricultural and Livestock Officer.
1 Soil Conservation Foreman.
1 Veterinary Assistant.
4 Demonstrators.
9 Assistant Demonstrators.
1 Clerk.
13 Temporary Assistant Demonstrators.

BEREA

J. E. Matsela — Acting Agricultural and Livestock Officer.
1 Veterinary Assistant.
5 Demonstrators.
7 Assistant Demonstrators.
1 Clerk.
7 Temporary Assistant Demonstrators.

VACANCIES ON ESTABLISHMENT

5 Veterinary Assistants.
5 Demonstrators.
15 Assistant Demonstrators.